Tooling & Production Magazine

SEPTEMBER 1959

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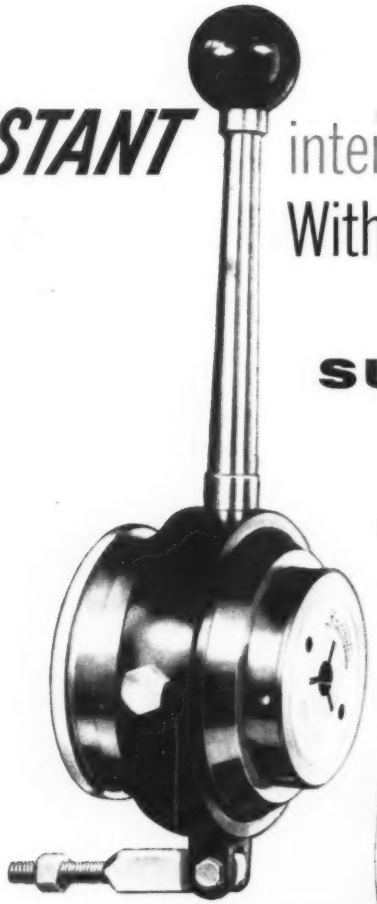
INSTANT internal and external chucking Without Stopping Spindle!*

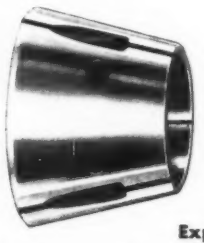
*For bar or expanding arbor work

SUTTON Levermatic COLLET CHUCK



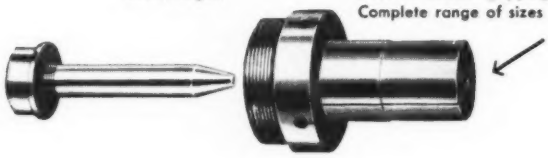
Boost production on any of your machines with this revolutionary precision chuck! Easy to use. A simple finger-tip adjustment determines exact amount of pressure to set and maintain any type of work—powerful grip for heavy cuts of tough steel, or a firm but gentle grip for thin tubing. Takes maximum bar stock capacity of spindle. Produces no heat or friction.

Likewise, the Levermatic can be used effectively as a non-rotating work-holding device on milling machines, gear hobbers, grinders and many types of special machinery. Available in three sizes —1″, 1½″ and 2″ capacities.



Co-netic Collet ⟶
Separate sections allow full floating, self-aligning action in each jaw. Applies uniform pressure over entire length.

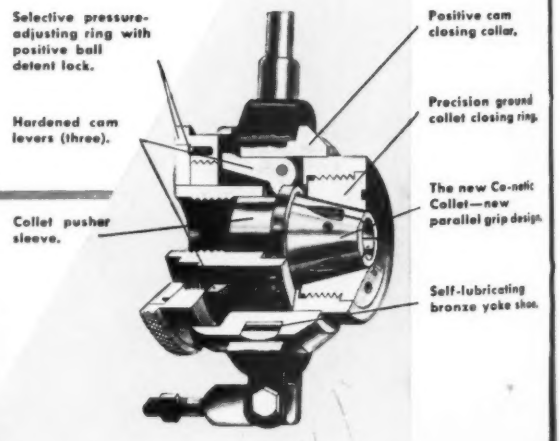
Expanding Arbor
Mounts quickly, directly to spindle nose for internal gripping. Complete range of sizes available.



RUNS AS TRUE AS THE SPINDLE

Sutton Tool Company

Dept. TP-9, Sturgis, Mich.


Selective pressure-adjusting ring with positive ball detent lock.
Hardened cam levers (three).
Collet pusher sleeve.
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The new Co-netic Collet—new parallel grip design.
Self-lubricating bronze yoke shoe.

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CIRCLE INFORM-A-GRAM KEY NO. 2

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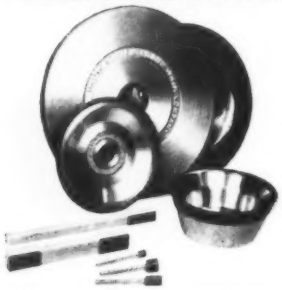

THE PERFORMANCE BOND

This wheel is a precise duplication of your specification, warranteed when properly operated, to give you the lowest cost per cut of any wheel.

Write for our catalog No. 957 or call us at Aurora (Illinois) 7-9181 for "Progressive Specifications" on your job without any obligation on your part.

US UNITED STATES DIAMOND WHEEL CO.

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CIRCLE INFORM-A-GRAM KEY NO. 4

TOOLING & PRODUCTION Magazine

SEPTEMBER 1959
VOL. XXV No. 6
GEORGE J. HUEBNER, Founder
1885 - 1956

PERSONALLY SPEAKING

Dear T & P Reader:

As this is being written, the steel strike of 1959 is still going on. I hope that it will be over by the time you have the opportunity to read what I'm writing.

Much has been said about the steel strike for and against both sides. It is historical fact that in the United States there has been an increasingly higher valuation placed on human skills and abilities — and rightly so. It is also a fact that there has been a decrease in the earning power of money. The latter is well taken care of first by the fact that more than half of every dollar earned by corporations goes to the federal government in taxes. It is further taken care of by very high inheritance taxes and by taxation on individuals' incomes at varying rates up to 91%.

Labor justifies the strike on the basis of the steel industry's record earnings in the first six months of 1959. Actually, earnings are a very small portion of the total dollars turned over to produce the earnings. And, the difference between making a profit and sustaining a loss is too often a very small per cent of business done or not done.

In this day and age many companies have bonus or profit-sharing plans. Employees of these companies then are taking a chance on receiving more than their regular pay. In other words, part of their compensation is contingent upon the profit results the company achieves. Why doesn't labor management ever seem to seek for its members a share of profits instead of demanding fixed increases that sooner or later lead to higher prices? The present strike seems to be an effort to limit profits. There are plenty of natural limits on profits already. So they just can't get excessive. But labor might gain a greater share of these profits by seeking a profit sharing arrangement, rather than by demanding increases in hourly rates. **Everyone** could benefit by labor sharing the responsibility for keeping expenses down in order to increase profits.

But profit sharing probably will not be sought because if obtained, it would take away an issue. We heard quite a bit a few years ago about the guaranteed annual wage. But that died out rather quickly, probably because, were that goal to be achieved, there would be little need for unions. I'm sure that if an individual company worked out an arrangement to pay its production workers a guaranteed annual wage, it would be accused of trying to smash the union.

The economic loss of this steel strike is estimated as being an inconceivable sum every day that it lasts. I hope it's over by the time you read this. I wonder if we'll ever see the day when both sides of a strike situation will conclude that any settlement short of a strike is always better than having a strike.

Cordially yours,

Ray Huebner

Publisher

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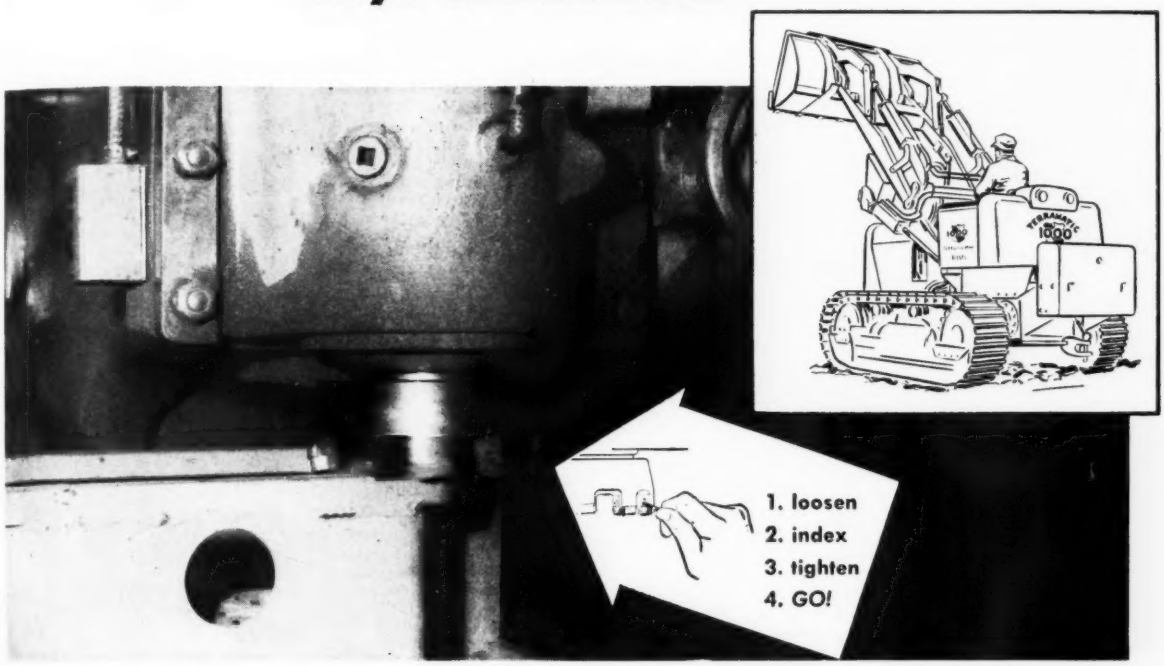
V-R Milling Cutters are dependable says J.I.CASE



16 months of continuous milling on TERRAMATIC transmission housings

It's no "pink tea party" when you chew a quarter-inch of rough 1015 Weldment Steel casting — spinning the milling cutter at 800 s.f.p.m. That milling cutter's got to be tough — *plenty tough* — and the carbide inserts need real "backbone."

J. I. Case found the right combination in V-R Face Mill Cutters with V-R throw-away carbide inserts. Big demand for Case Terratrac dozers, diggers, and crawlers, with Terramatic Transmission, has kept production lines humming — 2 and 3 shifts a day — 16 months continuous production. In this picture there's no place for excessive downtime, or delays for tool regrinding. V-R Face Mill Cutters provide cutting edges right on the job — a turn of a wrench — index the insert to a new cutting edge — tighten — and away you go! (Minimum maintenance problems, too: in *16 months production only 3 sets of main screws and 1 chip breaker plate needed replacing.*)

Your V-R representative has the facts on Face Mill Cutters and all carbide cutting tools — call him in today or send for Catalog VR-58.

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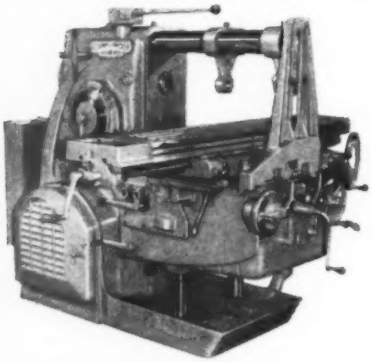
CIRCLE INFORM-A-GRAM KEY NO. 5

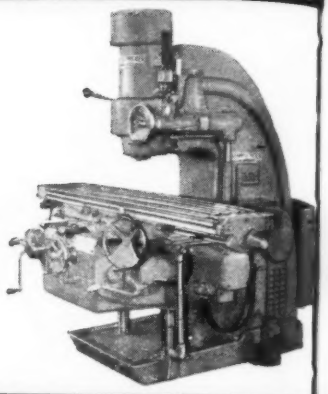
Kearney & Trecker machine tools

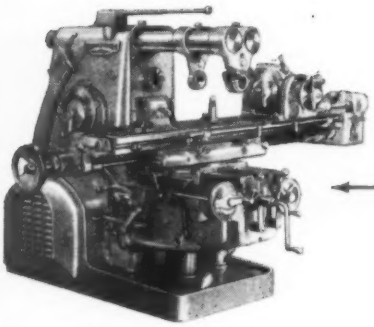
quality...greater economy and



TF Series Line

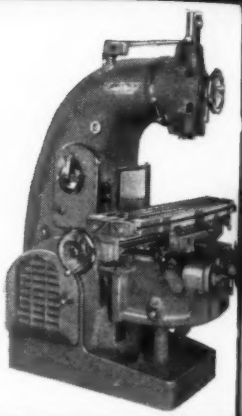
Strikingly new milling machines feature twin screw knee support for greater rigidity; new control center for ease of operation; improved Mono-Lever and Automatic Cycle Table Control; front-mounted backlash eliminator; adjustable saddle clamping gib; three bearing spindle that increases rigidity eight times over spindles without center bearing support, and many other features. TF's are available in five sizes Plain (left), Universal and Vertical (right) styles from 10hp to 50hp. (Catalog No. TF-50)

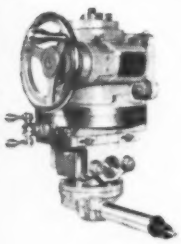




CH & CHL Milling Machines

These modern knee type milling machines incorporate the latest design and operating features... greater capacity for power, speeds and feeds. Machines are available in Plain, Universal and Vertical styles.. 3 to 10hp. (Catalog No. CH-3)



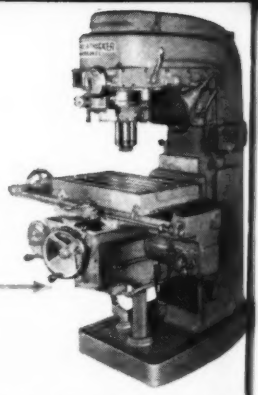


Attachments and Accessories

A complete selection for every milling requirement to convert standard machines into special purpose tools. Provide maximum productivity by supplementing with any of the various Kearney & Trecker standard attachments. Bulletins available on request.

Model 2D Rotary Head

Rotary head motion, combined with milling machine's ability to do boring, slotting, drilling, vertical milling, circular and angular milling, transmits complete blueprint into metal without changing setup. Speed range 250 to 4000 rpm; feed range .0002 to .008 ipr; rotary head feed range (16 changes) 2 to 3 rpm. (Catalog No. D-20)



TOOL-LEASE

Should you desire, you can conserve capital, reduce ob-
lescence using Kearney & Trecker's Tool Lease progr
You can choose the machines you need from nearly
different standard milling and precision boring machi

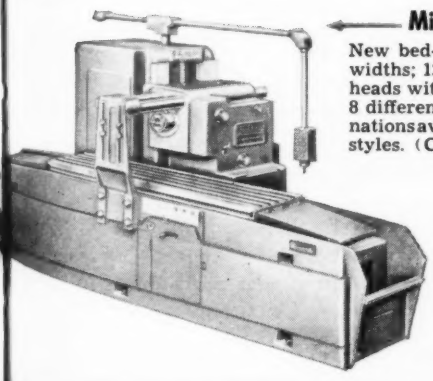
Designers and Builders of Precision and Productio

offer you more productivity and performance than ever before...

TODAY, Kearney & Trecker gives you several complete new lines of knee and bed type milling machines, precision boring machines and special production machines to meet growing metalworking needs.

Note the *exclusive* twin-screw support of the massive knee and saddle on the new TF Series milling machines... the compact, central control grouping... profit-making features typical of the advanced design you'll find on every machine shown.

For complete information on these new machines, see our nearest representative. Ask for catalogs listed here, or write Dept. TP-99, Kearney & Trecker Corp., Milwaukee 14, Wis.

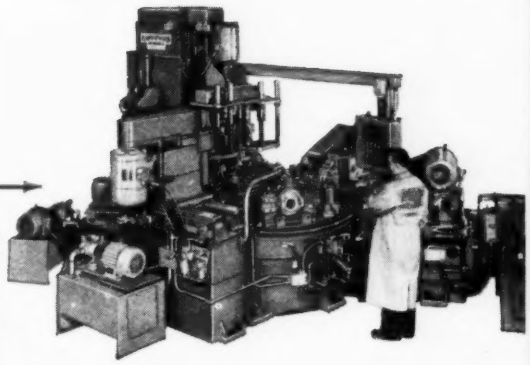


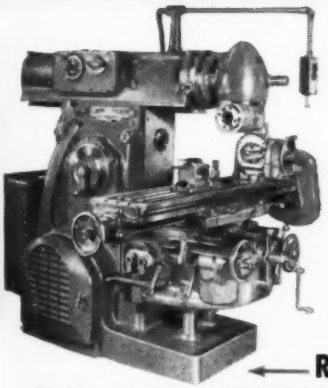
Mil-waukee-Mil Series

New bed-type design features: 4 table widths; 12 table sizes; 3 sizes of spindle heads with 3 speed ranges in each size; 8 different hp ratings. Over 300 combinations available in Simplex and Duplex styles. (Catalog No. MM-55)

Special Rotary Indexing and Transfer Machines

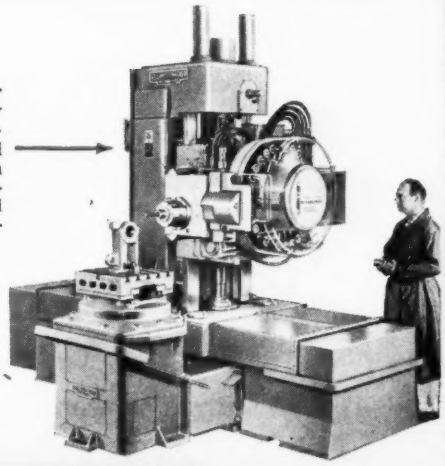
This 5-station rotary indexing machine features standard units: feed slides, quill feed, drill power units and rotary index table. Other special machines available. (Catalog No. SMD-10 and Data Sheet 1076)





Numerically controlled MILWAUKEE-MATIC

This single unit, tape-controlled machining center, unifies three basic processes — milling, drilling and boring. It is flexible automation of simple and complex machining operations on small- and medium-size lot production. Thirty-one tools are changed automatically on this new tape-controlled production machine. (Catalog No. TG-58)



Ram Head Milling Machines

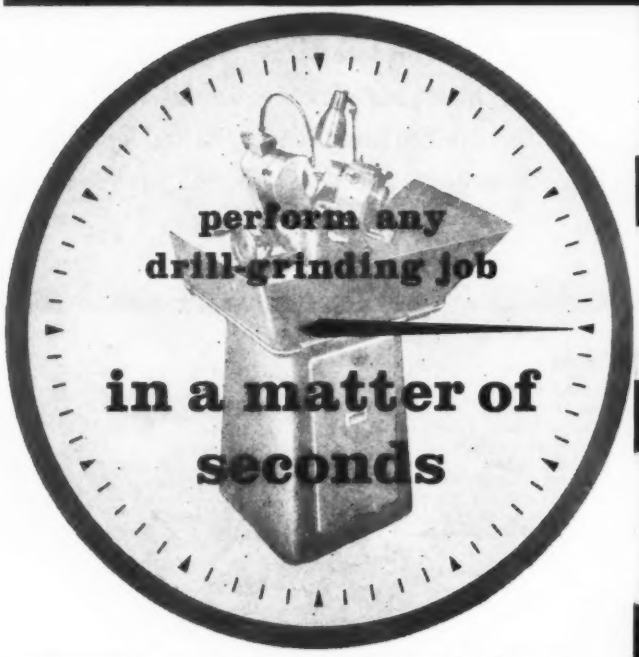
Machine combines standard horizontal spindle with separate motor-driven vertical spindle mounted on sliding Ram. Ram may be equipped with either Universal, Vertical or Quill type head. Machines available in No. 2 to No. 4 sizes, Plain and Universal styles (Catalog No. RH-10)

Machine Tools Since 1898

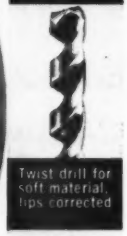
KEARNEY & TRECKER MILWAUKEE

develop your angles
and repeat them!

ALINA SELECT-O-POINT drill grinders



Right hand twist drill, with centre


Twist drill for soft material, lips corrected

Three-flute drill (core drill)

Spot facing cutter angle 180°

Screw tap, grinding of the angle of rake

Designed for rapid and accurate grinding of: Twist Drills • Sub Land Drills • Step Drills • Spot Facing Cutters • Keyway Milling Cutters • End Mills • Reamers • Screw Taps • Engraving Needles, etc.

Three models to choose from — *No. 01-2 Range .004" thru .080"—No. 03-6 Range .012" thru .250"—No. 2-32 Range .080" thru 1.250".* Each machine is a complete system built around a *planned drill point.* Applied to twist drills, this new drill point will increase the useful life of your drills — reduce the drill thrust force — eliminate the need for center punching — produce a rounder and more accurate hole — and on the larger drills afford you a drill point that will produce a round and almost burr-free hole in sheet metal. Fully variable adjustments may be accomplished with a minimum of effort; settings once selected may be altered or repeated *exactly* at any time. Accuracy and simplicity is built into each machine.

WRITE FOR ILLUSTRATED LITERATURE.

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W. F. Wolf Machinery Co., 2910 Santa Fe Ave., Los Angeles 58, Calif.
Lemuel R. Lance, Inc., Fifth & Courtland Sts., Phila. 40, Pa.

CIRCLE INFORM-A-GRAM KEY NO. 8

* * * * * * *

Talk of the Month

* * * * * * *

Reliability The Alpha and Omega of Products *

*by A. A. Hendrix***

RELIABILITY HAS BECOME A KEYSTONE in modern day industry. Particularly with those of us who are dealing in space age hardware.

How does one define this all important intangible? . . .

Reliability is a way of life . . . a way of thinking . . . an approach. You might say reliability is having something do what it is supposed to do at the time it is supposed to do it and in the way it is supposed to do it.

Reliability encompasses the principles of concept . . . design . . . action and movement. It can concern a component . . . a piece of hardware . . . schedule . . . a service . . . an employee, or whatever there is where action is taking place.

Reliability is the alpha and omega of all of our products and services.

* * *

. . . Reliability can be achieved only if it is set as a goal at the beginning of the design procedure . . . which of course recognizes the fact that the concepts must be reliable.

Reliability transcends the boundaries of each department within an organization as well as between organizations. It must be a team effort.

* * *

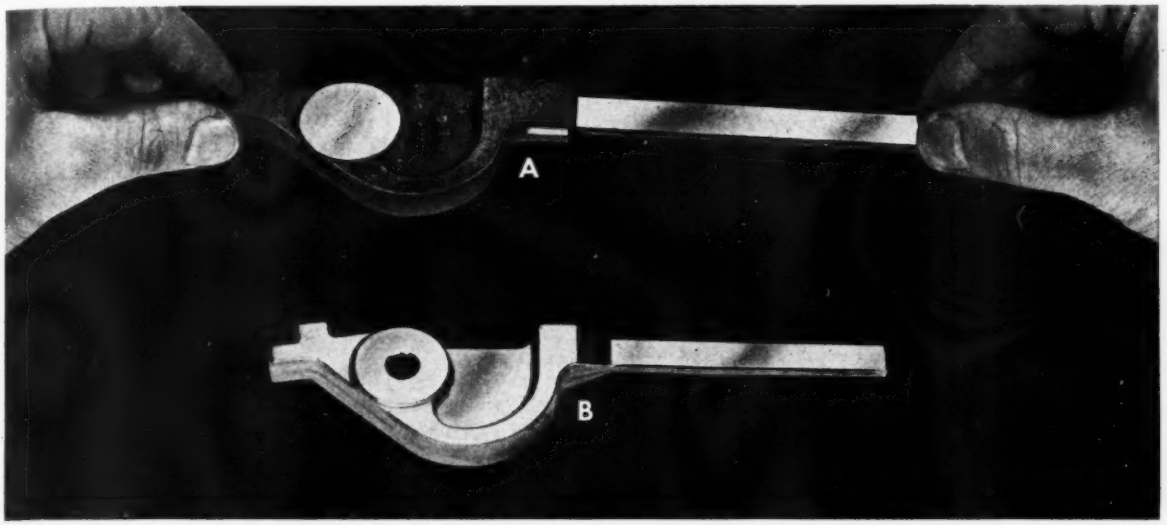
. . . Continued on page 10

*Delivered at the recent Detroit Space Age Conference.

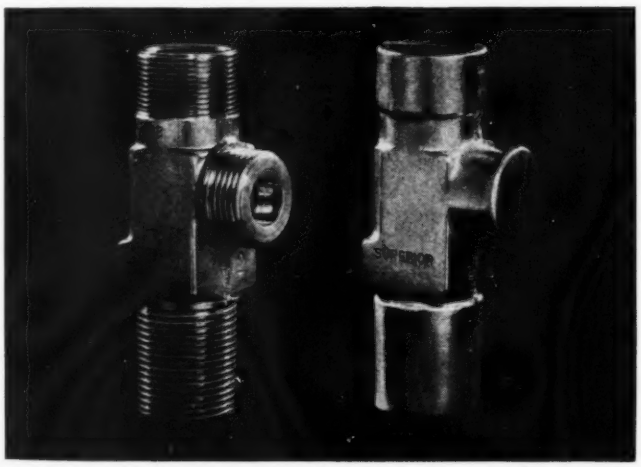
**Assistant Manager, AC Spark Plug Division, Milwaukee Operations, General Motors Corporation.

QUALITY CONTROL PLUS SAVINGS

Value analysis suggested the use of a die-pressed forging. The result: an 85% cost reduction and a stronger, tougher part.



SWITCH BLADE in overspeed limiting device on large General Electric motor-generators was originally an assembly **A**—an arm brazed to a brass casting which was machined, slotted, and drilled. After review in the company's Value Analysis program, assembly was replaced by Anaconda die-pressed brass forging **B**. The superior strength of twice-wrought metal made possible a one-piece part. The excellent finish and consistent dimensional accuracy of the die-pressed forgings eliminated all machining but the drilling operation. The over-all cost is 15% of the original part.



VALVES FOR CHLORINE AND FLUORINE shipping containers must have unusual corrosion resistance and high strength. Superior Valve & Fittings Co., Pittsburgh, specialists in handling halogens, looked for a forging alloy that would be suitable. American Brass Company metallurgists suggested die-pressed forgings of a slightly modified Everdur®-1014, an aluminum-silicon bronze, for this chlorine-fluorine service, and this customer is finding wide use for it in other severe service, too. The twice-wrought metal of Anaconda die-pressed forgings has dense structure to prevent leaks—strength and toughness to take rough handling. Yet it can be machined in automatic-chucking machines resulting in good cost control.

THE vital job of controlling quality *and* costs may be easier than you think. Anaconda technical specialists will gladly help you find the right alloy and mill form to do both. See your American Brass Company representative or write: The American Brass Company, Waterbury 20, Conn. In Canada: Anaconda American Brass Ltd., New Toronto, Ont. 5940

DIE-PRESSED FORGINGS SPECIAL-SHAPE TUBES
EXTRUSIONS FABRICATED METAL PARTS

products of

ANACONDA®

made by The American Brass Company

CIRCLE INFORM-A-GRAM KEY NO. 9

PERTINENT QUESTION:

WHEN do you need the Profilometer®?

FACTUAL ANSWER:

Whenever you must precisely *know* the roughness of *any* production surface — quickly, dependably, in microinches (arithmetical or rms).

FREE BULLETIN LT14 gives details — describes cost-saving applications. May we send you a copy?

MICROMETRICAL MMC MANUFACTURING COMPANY
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Manufacturer of the PROFILOMETER®, PROFICORDER®, MICROCORDER, WAVOMETER®, ANDEROMETER®, VAROMETER, CHART VIEWER • Exclusive American Sales Agent for CENSOR Dimensional Gaging and Sorting Equipment

CIRCLE INFORM-A-GRAM KEY NO. 10

. . . Month's Talk from page 8

The efforts to furnish reliable parts is costly . . . in the short run . . . to both the contractor and the supplier in the missile program. However, in the long run, greater reliability will lower these costs.

It has been for this reason that extensive parts qualification programs have been undertaken.

It is here where the supplier obtains certain advantages from realizing his obligations. Advantages the supplier gets by conducting his own parts qualification tests. The results from these tests enable him to know the complete capabilities of his part before he offers it to a contractor. Knowing the deficiencies of his product under extreme environments before it becomes a salable item permits him to become competitive sooner. And the information he receives from a successful qualification test on his particular component or part can be used with many military contractors. This information also puts him in a better position on commercial sales.

There are also advantages which this method of procedure gives to the contractor — that is, the time element for qualification is drastically reduced and repetitive tests will become unnecessary and the cost of verifying these tests will be greatly reduced.

. . . We cannot expect to get these reliable parts at the same cost had these qualification tests not been run. Frankly, we expect to pay more for the proven reliable part than we would if we must carry the entire burden of qualification.

* * *

. . . We have . . . combined the functions of quality control which had been purely a manufacturing responsibility — with our reliability control, formerly an engineering function. These two areas of responsibility have

. . . Continued on page 12

Simple...Positive...Faster...Accurate Indexing with TRIG-R-DEX

Trig-R-Dex is a completely new concept in manual indexing that simplifies and speeds straight or spiral operations.

To index—simply grasp the Trig-R-Dex handle, push down on the trigger button and move the handle until index pin engages the next hole, pull handle to stop position and you have indexed one increment. During work processing operations, the Trig-R-Dex handle always remains stationary. But, the index plate is keyed to the driver holding the work center . . . this assures the index plate, center and workpiece turn as a unit.

By selecting proper index plate, both right- and left-hand operations having from one to ten spaces can be accurately indexed. Changing from one index plate to another is extremely easy and takes but a couple minutes.

Because Trig-R-Dex is simple in design, of rugged construction, easy to operate and precision made, it will give years of accurate, trouble-free service while reducing costs and boosting your production.

U.S. PATENT NO. 2,711,324

For further information, write to:

DETROIT REAMER & TOOL COMPANY

DRT & COMPANY

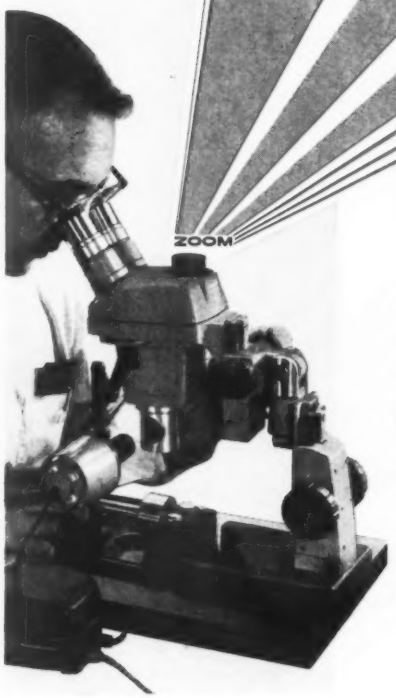
780 W. MAPLE ROAD • P.O. BOX 174 • BIRMINGHAM, MICH.

CIRCLE INFORM-A-GRAM KEY NO. 11

Only NEW BAUSCH & LOMB STEREOMICROSCOPES

give you

STEREO ZOOM



CONTINUOUSLY VARIABLE POWER

Here's a completely new optical concept to speed and simplify work requiring 3D views. Just turn the magnification knob and watch the brilliant stereo image zoom to the *exact* size you need. Not just a few fixed powers, but *any* power within the wide stereo range. The newest step forward to faster, easier 3D work . . . and it's exclusive with Bausch & Lomb.

***Featuring Exclusive* POWER POD Design Concept**

- Sealed to prevent dust and foreign matter from entering optical system!
- No nosepiece!
- No individual objectives . . . no objectives to change!
- No image jump!
- No image blackout!

***Featuring* NEW LOW PRICE**

. . . about one-third lower than previous line!

FREE! Mail coupon for 24-page book of actual case histories: how 3D Microscopes speed production.

BAUSCH & LOMB SINCE 1853

America's only complete optical source . . . from glass to finished product

BAUSCH & LOMB OPTICAL CO.
77345 St. Paul Street, Rochester 2, N.Y.

- ☐ Send me new B&L Stereomicroscope Catalog D-15.
- ☐ Schedule a demonstration at my convenience.
- ☐ Send case history booklet D-1089.

Name, Title .....

Company .....

Address .....

City ..... Zone ..... State .....

CIRCLE INFORM-A-GRAM KEY NO. 12

. . . Months Talk from page 10

been combined under our director of reliability, who has begun a comprehensive indoctrination program — including formal training courses — for people in all departments regarding their responsibility for reliable products and services.

Our suppliers and subcontractors can benefit from what we have done. We are eager to help them. . . We are scheduling discussions and seminars to better understand environmental requirements, to establish standardized environmental test methods of qualifying parts, to develop better methods of evaluating test results, and to establish quality control levels for receiving-inspection.

* * *

Also, the technical information regarding any particular type of part is channeled through a parts specialist engineer in the reliability department. This saves the subcontractor time, speeds up two-flow of information and increases the accuracy of information.

This program has already led to greater assurance of obtaining qualified parts.

All of us must strive to attain the utmost in reliability whether it is in our products or in our services . . . each must do what he is capable to achieve this goal.

BUY U.S. SAVINGS BONDS TODAY!

Deaths

Val C. Hart, 58, field sales engineer for The Bullard Co., died suddenly in his Fairfield, Conn., home June 30th.

Joseph Goodman, former sales manager for the J. T. Slocomb Co., died May 27 at the Rocky Hill Veteran's Hospital, Rocky Hill, Conn.

...they all prefer PRODUCTO die sets

DIE DESIGNERS
appreciate the *unlimited selection* of die sets which accommodate any type of die design.

DIE MAKERS
like the amazing speed and ease of "take-apart and put-together" made possible by Qwik-Fit Guide Pins. (Safer handling, too.)

PRESSROOM FOREMEN
are convinced that Producto die sets maintain accuracy through long runs, keep production up, downtime down.

CONTRACT SHOP OWNERS
have found consistent die set accuracy, dependable delivery, and smooth performance justifies the confidence with which they specify Producto.

Quick, jam-free assembly and disassembly, lasting accuracy, unlimited selection of sizes and styles! Add to these advantages the benefits of immediate service in every industrial center through Producto's growing network of 46 branch assembly plants and distributor warehouses...and you realize why "They all prefer Producto". • **A WEALTH OF DIE SET INFORMATION** is available to you, free, in the comprehensive, easy-to-use Producto Catalog No. 11, and in regular issues of *Die Set Digest*. Write today for these valuable aids.

THE PRODUCTO MACHINE COMPANY
945 Housatonic Avenue, Bridgeport 1, Connecticut

PRODUCTO

PRODUCE MORE WITH PRODUCTO PRECISION DIE SETS

CIRCLE INFORM-A-GRAM KEY NO. 13

COST CUTTING PRODUCTION AIR TOOLS...

"AIRFEEDRILLS"®
For automatic, semi-automatic, portable or stationary drilling.

SCREW DRIVERS
Powerful units for fast, precision screw driving and nut setting.

IMPACT WRENCHES
Powerful air impact wrenches make the tough jobs easy.

choose from the complete Gardner-Denver line

NUT SETTERS
Multiple-spindle units for high-production screw driving or nut setting.

AIR DRILLS
Air drills for drilling, polishing, routing and shaping.

PLUS . . .

- Ratchet Wrenches
- Tapping Machines
- Air Hoists
- Air Grinders
- Chippers
- Scalers
- Compression Riveters
- Air Motors
- Air Tool Accessories

FOR COMPLETE INFORMATION
Contact your Gardner-Denver Representative or write for Bulletins.

EQUIPMENT TODAY FOR THE CHALLENGE OF TOMORROW

GARDNER-DENVER

Gardner-Denver Company, Quincy, Illinois
In Canada: Gardner-Denver Company (Canada), Ltd., 14 Curity Avenue, Toronto 16, Ontario

CIRCLE INFORM-A-GRAM KEY NO. 14

The Machinery Hydraulics Division of Vickers Inc., has announced the promotion of **Arthur H. Van Wormer** to sales manager of the Industrial Products Department.

Recently appointed manager of distributor sales at Simonds-Worden-White Co. is **B. H. Wildenhaus.**

Rchard H. Melvin is now the Detroit area sales engineer for Press Automation Systems, Inc.

Richard J. Dietz has been appointed district sales representative for E. W. Bliss in the northern Ohio and Indiana territory, and **Thomas E. Marquardt,** the New England area.

George H. Malony takes over as assistant sales manager for The Whitman & Barnes Division of The United-Greenfield Corp., following the retirement of **E. S. Anderson.**

New Ohio regional sales manager for Latrobe Steel Co. is **Harold C. Burgess. M. W. Saxman, III,** succeeds Burgess as Cleveland district manager.

Don Miller heads a new sales company, D. E. Miller Co., to represent the Colonial Broach and Machine Co. lines in Michigan.

The Capewell Mfg. Co. has appointed **Charles T. Peele** as sales engineer in Wisconsin, Minnesota, and Iowa.

Appointment of **Nicholas Vaters** as sales engineer in the New England area has been announced by the Industrial Sales Division of Cleveland Pneumatic Industries, Inc.

Serving in western Illinois and eastern Iowa for Simonds-Worden-White Co. is **Harry C. Holmes.**

The promotion of **Norman F. Weyland** to general sales manager was recently made known by Wales-Strippit, Inc.

"The Tool & Die Makers Surface Grinder"

Harig's NEW TML 6x12 SURFACE GRINDER

THE NEW TML BY HARIG PROVIDES EXTREMELY FAST AND ACCURATE GRINDING—STURDY CONSTRUCTION—ADVANCED DESIGN WITH ECONOMY IN MIND. . . *THE LOW COST WILL PLEASE YOU!*

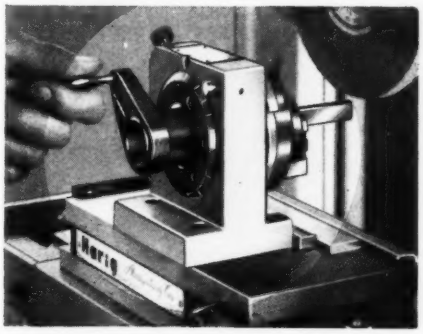
OUTSTANDING FEATURES

- Solid one piece construction of spindle housing and vertical slide.
- Elevating screw centrally mounted.
- Combination "V" and flat ways assure positive alignment.
- Angular rack and pinion mounting distributes wear equally along rack and pinion face.
- Motorized Spindle, dust collector and water unit available.

SPECIFICATIONS

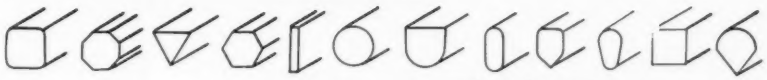
Longitudinal Travel	12-3/8"
Cross Feed Travel	7"
Vertical Working Height (Under 7" dia. wheel)	0" to 12-3/4"
Platen Working Area	6" x 12"
Grinding Wheel	7" x 1/2" x 1-1/4"
Elevator Handwheel Graduation	.0005
Cross Feed Handwheel Graduation	.001

Remember: Harig's Famous Precision is in Evidence Throughout!



Harig's IMPROVED Grind-All FIXTURE

"The Latest Advancement in Perforator Grinding"



Fast, accurate perforator grinding fixture — hand crank for easy rotation of index plate, single locking screw for making quick set-ups. Easily grinds irregular shaped perforators concentric with shank within ±.0001 accuracy. Also can be used as milling, boring and inspection fixture. NEW! RADIUS DRESSER ARM—attachment makes Grind-All Fixture a highly accurate radius dresser.

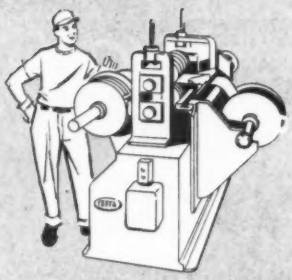
made by the house that precision built!

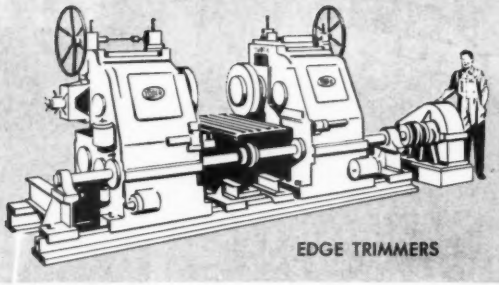
Harig Manufacturing Corp

5761 W. Howard St., Chicago 31, Ill.

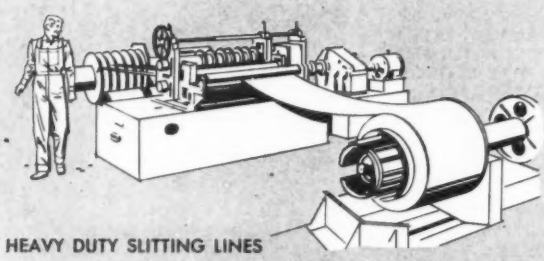
CIRCLE INFORM-A-GRAM KEY NO. 15

SELF-CONTAINED SLITTERS





EDGE TRIMMERS



HEAVY DUTY SLITTING LINES

YODER SLITTERS

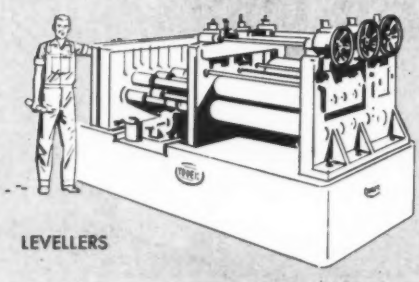
basic equipment for cost-conscious users of strip!

To help meet the demands of tight production schedules, YODER Slitters reduce mill-width stock quickly and economically to desired widths. If your needs are as low as 100 tons per month, time and manpower savings alone will offset the cost of your YODER Slitter in a matter of months, while reducing basic inventories. Compactly designed, standard YODER Slitters are built to handle standard coil widths... completely engineered lines for special requirements.

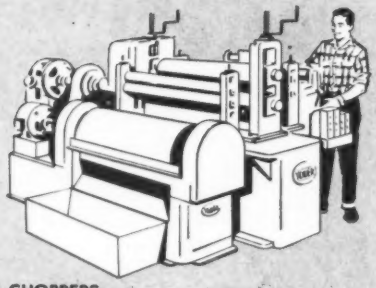
YODER accessories, such as coil cars, swivel unloaders, scrap choppers, scrap disposers, plate levelers and coil boxes, make stock handling fast and easy.

YODER also makes a complete line of Cold Roll-Forming equipment and Pipe and Tube Mills. To profit from YODER'S years of engineering and service experience, contact your local YODER representative or send for the fully illustrated descriptive, YODER Slitter Manual; it's yours for the asking. Write to

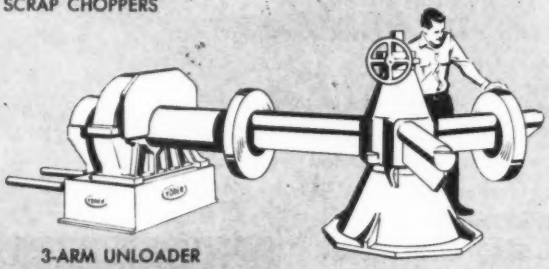
THE YODER COMPANY
5501 Walworth Ave. • Cleveland, Ohio



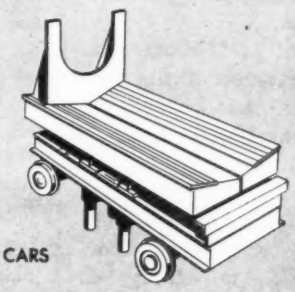
LEVELLERS



SCRAP CHOPPERS



3-ARM UNLOADER



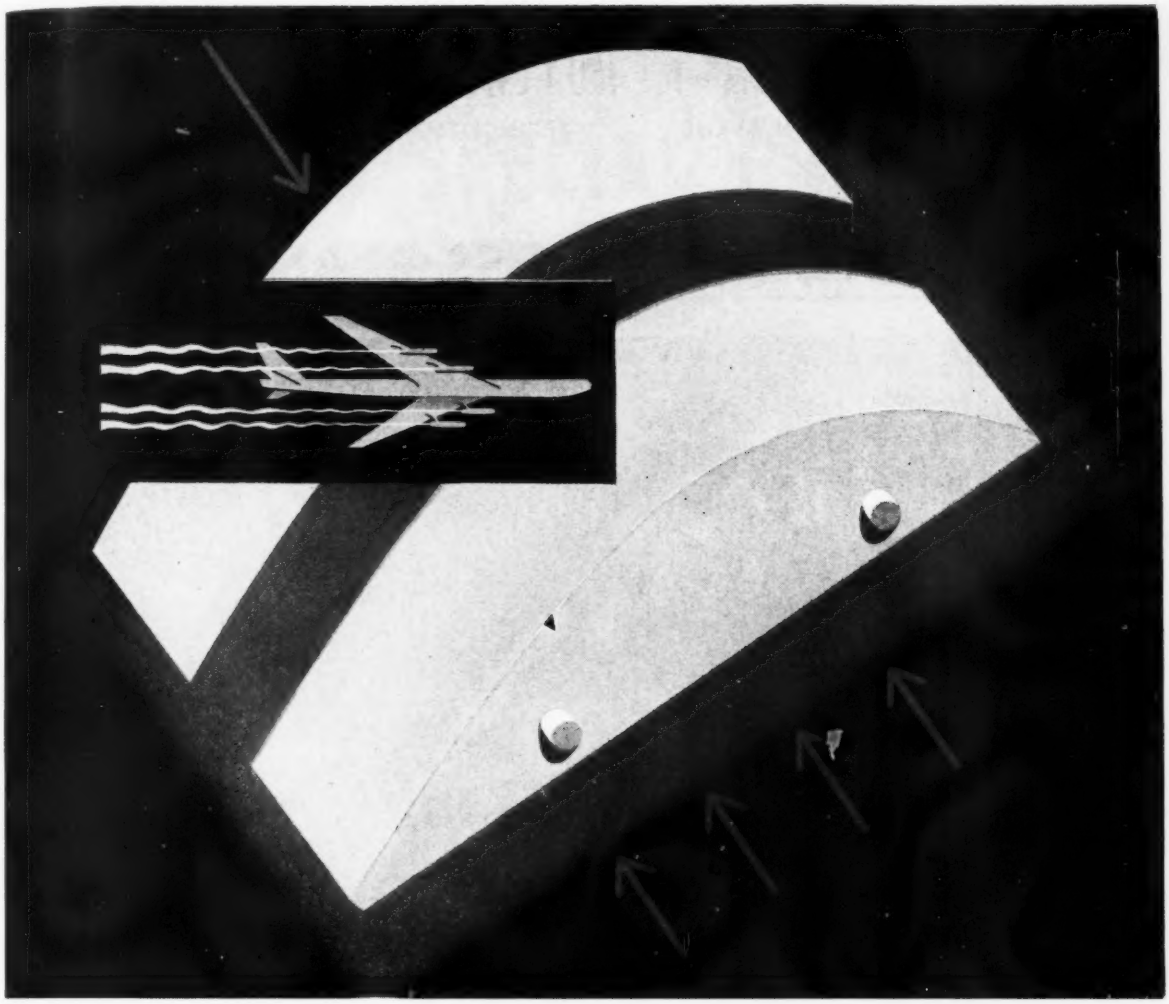
COIL CARS

ENGINEERING **YODER** MANUFACTURING

ROTARY SLITTING LINES

PIPE AND TUBE MILLS (ferrous or non-ferrous)
COLD ROLL FORMING MACHINES

CIRCLE INFORM-A-GRAM KEY NO. 16



Save up to 30% in cost, 60% in time with EPON® RESIN tools and dies

Your tooling resin formulator will show you how Epon resin formulations save time and money in applications such as these:

High temperature tooling: Metal forming stretch dies that can operate at temperatures over 400°F.

Heated tools: Matched dies, with integral heating units, may be made with Epon resin formulations for rapid heat curing of laminated plastic parts.

Long-lasting metal forming tools: Castings made of formulated Epon resin, mounted in a crank press, showed no permanent deformation after 28,000 compression-shock cycles.

In addition, Epon resin formulations offer you the following advantages:

Excellent tolerance control: Little machining and handwork are required to finish Epon resin tools because of the material's excellent dimensional stability and lack of shrinkage.

Outstanding strength: Jigs and fixtures with thin cross sections can be built from Epon resin-based formulations reinforced with glass cloth. The resulting laminate has high flexural strength and excellent dimensional stability.

Easy modification: Tools and fixtures made from Epon resins may be quickly and easily modified to incorporate design changes.

CONTACT YOUR TOOLING RESIN FORMULATOR

The combination of resin formulator's skill and practical knowledge, backed by Shell Chemical's technical research and experience, has solved many important tooling problems for industry. Your own formulator specialist can help you solve yours. For a list of experienced tooling resin formulators and additional technical information, write to:

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50 WEST 50th STREET, NEW YORK 20, NEW YORK
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SHELL

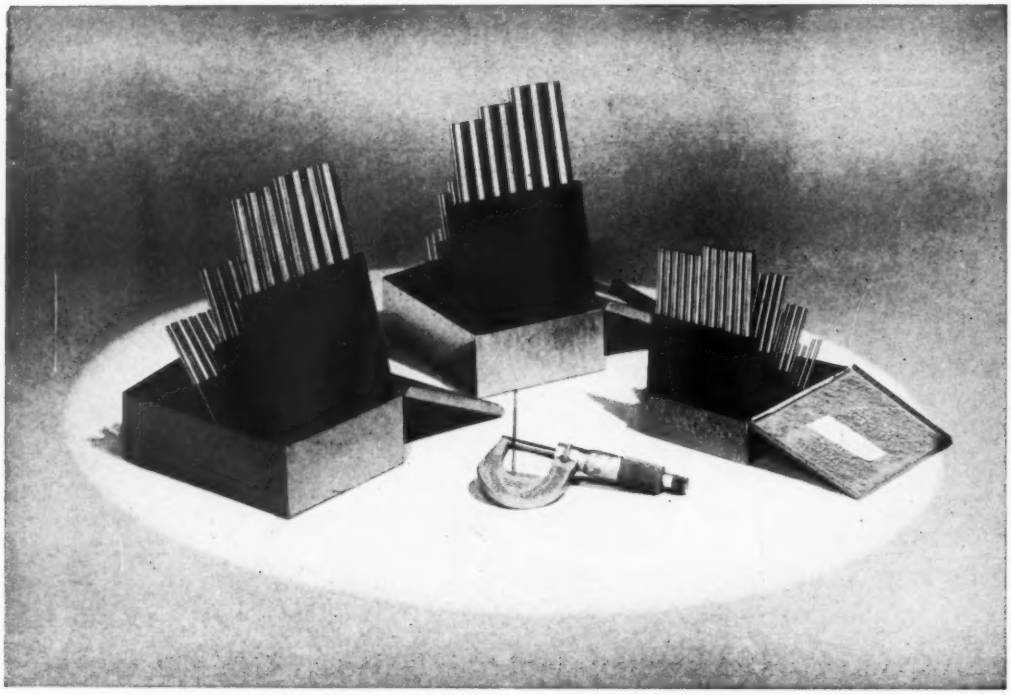
CIRCLE INFORM-A-GRAM KEY NO. 17

DRexel 6-4222 ESTABLISHED 1927

WILLIAM T. HUTCHINSON CO.

53 BROWN AVENUE SPRINGFIELD, NEW JERSEY

HUTCHINSON HSS BLANKS



115 Pieces – COMPLETE – .040" to .500" – $88.00

your choice of two tolerances
+ .0002" – .0000
or
+ .0000 – .0002"

JOBBER SET	LETTER SET	WIRE SET
$32.27	$29.03	$27.40
in Huot Index	in Huot Index	in Huot Index

M2 — HIGH SPEED STEEL — 64 "C" scale hard — gage tolerance — mirror finish — parallel ground.

ANY DECIMAL DIAMETER OF STANDARD LENGTH
.012" TO 1.000" SHIPPED ON 24 HOUR NOTICE

CIRCLE INFORM-A-GRAM KEY NO. 18

SIX STANDARD ANSWERS TO A HUNDRED SPECIAL PROBLEMS

The line-up above represents basic models of the H-P-M C-Press line of hydraulic presses, capacities to 15-ton. Literally hundreds of daily chores fall within this tonnage range. They offer individual pressure, stroke and speed characteristics for a variety of jobs on each.

With the C-Press, every element of control is quickly and simply established by convenient adjustments. Tooling changes and individual requirements for speed, stroke and pressure can be met with minimum time and trouble.

1 **THE H-P-M 15-TON C-PRESS**
For manual or automatic cycling, fast traverse and controlled pressing, electric stroke adjustment. Compact, sturdy, completely J.I.C.

2 **THE H-P-M 10-TON C-PRESS**
Has dual electric safety controls, manual cycling, large daylight and long stroke — the bench type press for an amazing range of jobs. As with all C-Presses — J.I.C.

3 **THE H-P-M 5-TON C-PRESS**
For pressure sensitive servo control. Ram performs in direct response to manipulation of the single hand lever control. Ideal for straightening and general maintenance work.

4 **THE H-P-M 5-TON C-PRESS**
Has straight manual control — easily the most useful press you can own. Completely adjustable for all production requirements; completely dependable for everyday manual type jobs.

5 & 6 **INDEX TABLE C-PRESSES**
At the far end are two models of the versatile *Index Table C-Presses, 5-ton models.* One for six station indexing, the other for twelve. Interlocked hydraulically with the press power system, the index table places practical automation within reach of even the smallest shop. They're infinitely adjustable and adaptable to modern demands for standard simplicity, special application. They're the press line around which to build your automatic assembly operations . . . at lowest cost.

Send for informative catalogs, today. See your nearest H-P-M representative at your first opportunity.

THE HYDRAULIC PRESS MFG. COMPANY

A Division of Koehring Company • Mount Gilead, Ohio, U. S. A.

CIRCLE INFORM-A-GRAM KEY NO. 19

"Clausing - best vertical miller for small parts manufacturing"

...SAYS HAROLD MEYERS

HERE'S PROOF OF PERFORMANCE:

"Any job within the capacity of the machine can be handled easier, and up to 50% faster, on a Clausing than on any other mill. And, its accuracy is not exceeded by mills costing more than twice the price — in fact, we use our Clausings for some of our jig bore work. You just can't beat it for small parts manufacturing."

HAROLD MEYERS MEYERS MACHINE CO. GRAND RAPIDS, MICH.

This report is typical of the experience of users everywhere. The CLAUSING VERTICAL MILLER is a precision machine tool designed for operations where "extremely accurate" machining is required. The spindle head can be swiveled in a vertical plane and set at any angle, and turret rotated in a horizontal plane making it possible to mill, drill, bore, ream, shape at all angles with one set-up.

Before it leaves the factory each CLAUSING Mill must pass rigid tolerance tests such as: top of table perpendicular to column ways within .0005" in 6" travel . . . T-slots square with cross slide dovetails within .0005" . . . table, parallel to turret within .001" . . . spindle square with table, front to rear, within .001" T.I.R. in 5" circle . . . spindle taper (internal) run out within .0002" at spindle nose . . . table T-slots parallel to table dovetail ways within .0005" in 8" longitudinal travel.

It is an outstanding producer, "most versatile, easiest to set up, get around and operate of *any* miller at or near its low price." Only $850 f.o.b. factory . . . see it before you buy any milling machine.

Write for Free Literature

CLAUSING

CLAUSING DIVISION
ATLAS PRESS DIVISION
9-115 N. PITCHER STREET • KALAMAZOO, MICH.

CIRCLE INFORM-A-GRAM KEY NO. 20

YESTERDAY'S PIONEER . . . TODAY'S LEADER

WELDON / COUNTERSINKS AND DEBURRING TOOLS

60°, 82°, 90°, 100° ANGLES

CHATTERLESS!

Greater ease in cutting and longer life are the outstanding features of these Weldon tools for countersinking and deburring operations.

Chatter is eliminated because of the single cutting edge.

A trial will convince you.

THESE TOOLS INCLUDE CUTTING DIAMETERS RANGING FROM 1/64" TO 3"

WRITE FOR FURTHER DETAILS

OVER 40 YEARS OF LEADERSHIP SINCE 1918

Catalog list numbers are now marked on all Weldon tools and holders as an aid when reordering . . . another WELDON FIRST.

Weldon distributors throughout U. S. A. and Canada carry complete stocks to serve you.

DBB

THE WELDON TOOL COMPANY

3000 WOODHILL ROAD . . . CLEVELAND 4, OHIO

CIRCLE INFORM-A-GRAM KEY NO. 21

faster...
easier...

TEMPLATE Assembly...

Drop a PEM Self-Clinching Drill Bushing into each on-center hole and apply squeezing pressure (with any standard press).

Template's finished.

That's how fast, easy, cost saving, PEM Bushings make Template production.

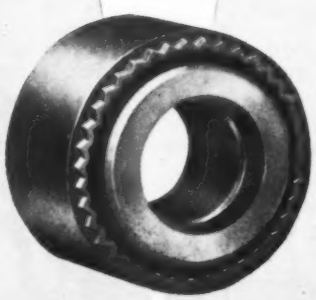
There's no riveting, welding, indexing, nesting, no outboard supports necessary. There's no chance for bushings to "cock" during installation.

Compression-clinching provides torque and push-out resistance far in excess of needs. Permits use of thin gauge, light weight templates (one-third conventional thickness).

Find out how PEM Bushings save their cost—plus a profit to you—in simplified assembly. Write for literature and sample for trial.

PEM

DRILL BUSHINGS



PENN ENGINEERING & MANUFACTURING CORP.
DOYLESTOWN, PENNSYLVANIA

CIRCLE INFORM-A-GRAM KEY NO. 22

MANUFACTURING MEMOS

Standards Manual . . .

A couple of valuable reference booklets were recently published by The American Society of Mechanical Engineers and the American Standards Association. One is Section 17 of the American Drafting Standards Manual, entitled Fluid Power Diagrams ($1.50). It establishes standard drawing practices for depicting systems that use a fluid within enclosed circuits to transmit and control power. The other booklet ($2.50) gives classifications of reamers. Write American Standards at 70 E. 45th St., New York 17, for copies.

Learn and Work Program . . .

Students working their way through La Sierra College in Arlington, Calif., can pay for their education by working and training for industry at Ace Drill Bushing Co., Inc.'s new plant, built on College land. "Construction of the modern manufacturing plant is a demonstration of company policy of linking industry and education for turning out a better product," remarked Alan Fisher, Ace president. He hopes to establish similar facilities in connection with other Colleges.

Racing To The Moon . . .

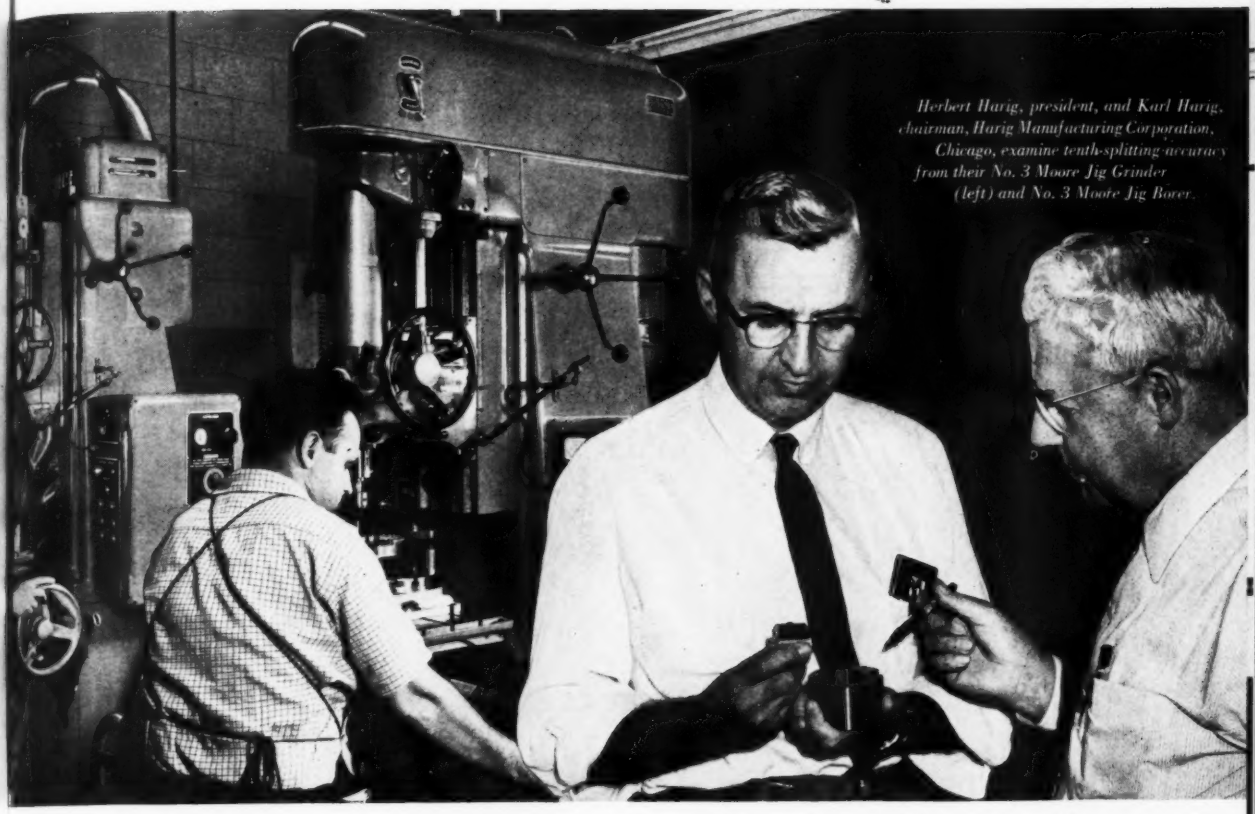
Another lap in the race for the outer space blue ribbon has been gained by The Martin Co. They've fabricated structurally sound beryllium sheet material to make the world's first beryllium structure. Beryllium's use in airframes solves aerodynamic and structural heating problems associated with space flight and re-entry of the earth's atmosphere at speeds up to 18,000 mph.

Power Press Safety . . .

Contributions of men familiar with practical and engineering problems of power press guarding and safe die design have helped make up a never-before-available 96-page Power Press Safety Manual. It covers safety, as linked with everything from power press construction to maintenance. National Safety Council, 425 N. Michigan Ave., Chicago 11, supplies copies at $3.10 each or special prices for more.

... Continued on page 26

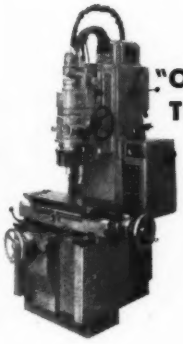
MOORE ACCURACY FOR THE MISSILE AGE



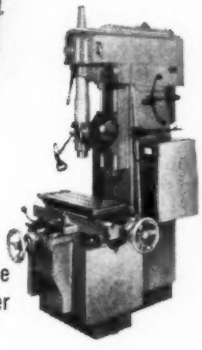
Herbert Harig, president, and Karl Harig, chairman, Harig Manufacturing Corporation, Chicago, examine tenth-splitting-accuracy from their No. 3 Moore Jig Grinder (left) and No. 3 Moore Jig Borer.

"We're now splitting tenths, thanks to Moore's new No. 3 Jig Borer and Jig Grinder"

"Our operators feel these are the best machines they have ever worked on... They take care of the tenth-splitting tolerances required by industry today."



No. 3 Moore Jig Grinder



No. 3 Moore Jig Borer

Made and calibrated to the New International Inch.

These are the words of two of America's acknowledged tooling leaders, active heads of one of America's foremost independent producers of accurate dies—carbide, lamination, progressive, and other precision tooling.

Says Herb Harig, president of Harig Manufacturing Corporation and former president of National Tool & Die Manufacturers Association: "Moore's line of Jig Borers and Jig Grinders has been an integral part of the development of our company from 15 employees in 1937 to 120 today. We have always been among the first to install each new model. That's why we are among the first with Moore's tenth-splitting No. 3 Jig Borer and No. 3 Jig Grinder. Over the years we have enlarged our Moore Jig Boring and Jig Grinding Department to 15 machines!"

Sums up Chairman Karl Harig: "When owner-management invests its money in machinery, it does so only after thorough analysis and careful selection. I don't know of any machine manufacturer which meets both these tests better than does Moore."

We stand ready to help you duplicate Harig's record of satisfaction. As a start, write today for our detailed literature on these new tenth-splitting machines with larger tables; hardened, ground and lapped ways; no gibs, no overhang.

MOORE SPECIAL TOOL COMPANY, INC.
726 Union Avenue, Bridgeport 7, Conn.

ADD MOORE TOOLS TO YOUR TOOLROOM

JIG BORERS • JIG GRINDERS • PANTOGRAPH WHEEL DRESSERS • PRECISION ROTARY TABLES • HOLE LOCATION ACCESSORIES

CIRCLE INFORM-A-GRAM KEY NO. 22

PIPE MACHINERY THREAD GAGES

As a precious stone is carefully cut and polished by an expert jeweler—so every Pipe Machinery thread gage is painstakingly lapped by experienced craftsmen to remove soft grinding skin, fat end threads and to produce a low micro finish.

Modern inspection facilities assure rigid operator control during every step of this important lapping process . . . assure a finished product of uniformly high quality with built-in wear life second to none.

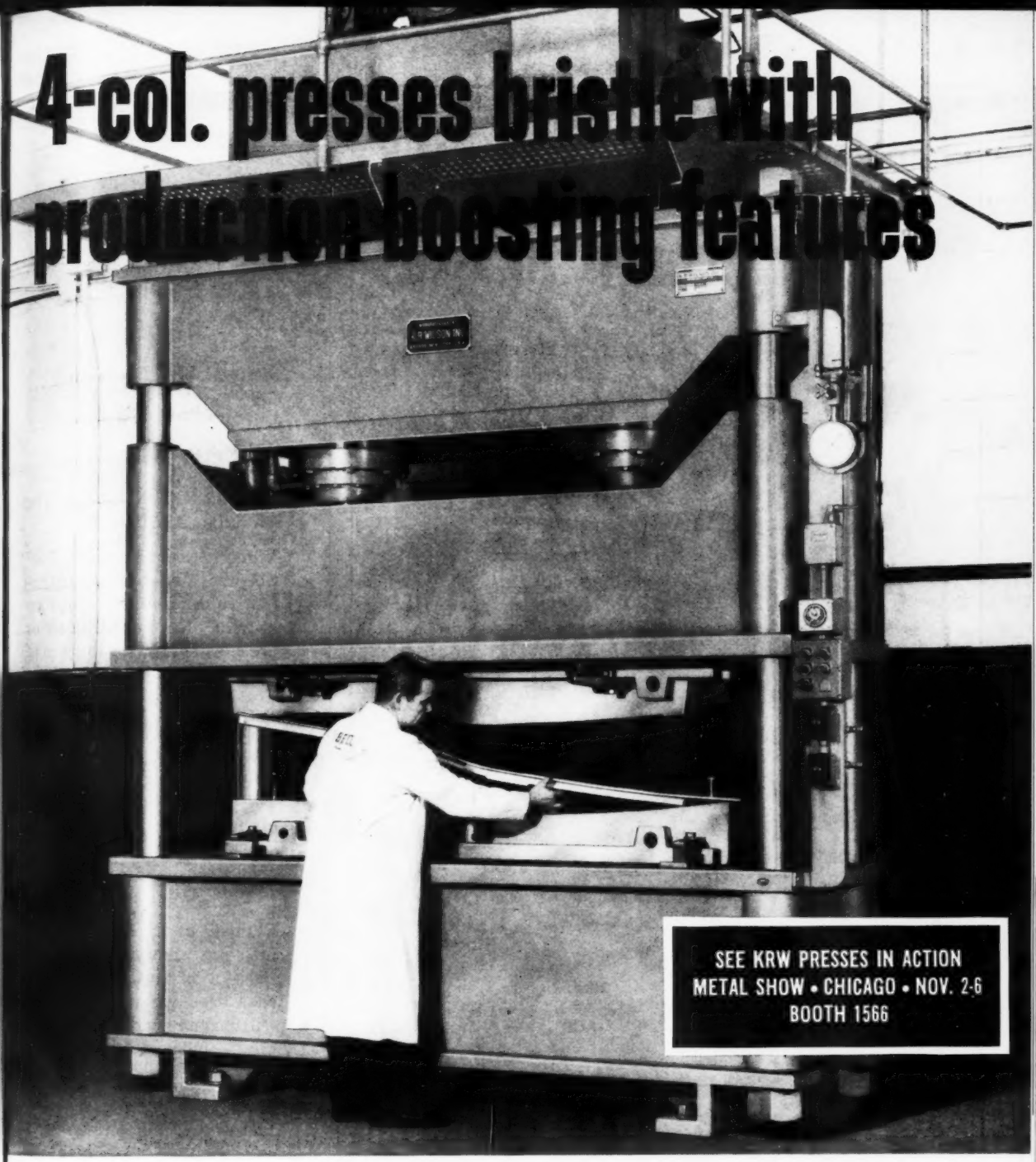
When you purchase a Pipe Machinery thread gage, you can be certain the best in material, the best in equipment and the best in human skill have gone into its manufacture.

Write today for further information on our complete line of gages.

THE PIPE MACHINERY COMPANY • 29100 Lakeland Boulevard • Wickliffe, Ohio • Greater Cleveland

CIRCLE INFORM-A-GRAM KEY NO. 24

4-col. presses bristle with production-boosting features



KRW has done it again! This time, the 25-1000 ton KRW line of 4-column, single action hydraulic presses has been modernized to set a new pace over a broad work range.

Bristling with newness, these smooth-acting machines are built to outperform even KRW's highly regarded, prior designs in a wide variety of assignments: Blanking, forming, punching, trimming, drawing, extruding, briquetting, straightening, pressure clamping, laminating and bonding.

Already acclaimed "a marked success," KRW's latest version of the 4-column press boasts numerous features to improve quality and increase productivity: Of rugged, welded steel construction, the crown, bed and sliding platen provide maximum resistance to deflection. Align-bored to automatically controlled tolerances, the sliding platen is guided on ground and polished columns which are closely fitted into the crown and bed.

Easy to adjust, KRW hydraulic systems assure instant, complete press control. Compactly designed, the pumping unit can be mounted at the top of the press or furnished for floor installation.

Available with either up-acting or down-acting platens, KRW 4-Column Presses can be outfitted with manual lever or electric push buttons for single or continuous cycling.

For detailed information and specifications, write for Bulletin 95-D. K. R. Wilson, Inc., 218 Main St., Arcade, N. Y.

KRW HYDRAULIC PRESSES

CIRCLE INFORM-A-GRAM KEY NO. 25

Only WESPO can supply ALL these WORK HOLDING DEVICES

TOGGLE CLAMPS and PLIERS 80 Types & Sizes
FIXTURE CLAMPS and LEAF JIGS Over 180 Types and Sizes
BASE MOUNTED SWING CLAMP NEW
NEW HINGE CLAMP
NEW "L" LOCK CLAMP
OVER 1000 TYPES & SIZES OF COMPONENTS

WRITE FOR FREE CATALOGS

WEST POINT MFG. CO.
26935 W. 7 Mile Road • Detroit 19, Michigan

CIRCLE INFORM-A-GRAM KEY NO. 26

MANUFACTURING MEMOS

Movie Time

Simplified production operations for hydraulic Multipresses are shown in a 25 min, 16mm film, "The Multi-Viewpoint." Other films on this subject are also available from Denison Engineering Div'n, American Brake Shoe Co., 1160 Dublin Rd., Columbus 16, Ohio.

New Additions

Ring Punch & Die, Inc. now operates as a division of The Producto Machine Co.

Van Norman Machine Tool Co. and Van Norman Automotive Equipment divisions of Van Norman Industries are now one firm, known as Van Norman Machine Tool Co., and headed by Paul W. Leming.

New Service

Colonial Broach & Machine Co. of Detroit now offers a broaching service to handle short runs and experimental production.

New Line

Ettco Tool & Machine Co., Inc., has acquired Auto-Tap Division of Automatic Methods Corp., operation of which will be moved to the parent plant.

Assets of Gould & Eberhardt, Inc. have been purchased by Norton Co. and will soon be moved to the Norton base.

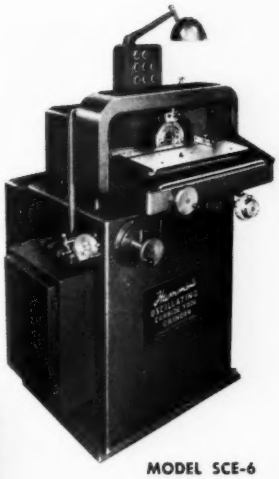
The Rzeppa constant velocity universal joint assets of the Gear Grinding Machine Co. have been acquired by Dana Corp. and will be operated as a separate division of Dana.

As a result of the acquisition of Engelberg Inc., Sundstrand Corp. has added a precision abrasive belt grinder line.

HAMMOND ELECTROLYTIC GRINDERS

are doing a job at Beech— a leading builder of aircraft

Hammond ELECTROLYTIC CHIP BREAKER AND OSCILLATING CUP WHEEL GRINDERS CUT CARBIDE TOOL GRINDING COSTS . . . greatly reduce diamond wheel consumption.



MODEL SCE-6

MODEL CBE-6

Today more and more manufacturers are turning to Hammond Electrolytic Carbide Tool Grinders to reduce their carbide tool grinding costs. Carbide is removed by electro-chemical action with the diamonds wiping away the products of electro-chemical decomposition. As a result —

- **Diamond wheel consumption is reduced 80% to 90% and green wheel grinding eliminated.**
- **Grinding is done faster and better with less physical effort.**
- **Heat fractures are eliminated as the process is cool.**

Many users report their installation paid for itself in a matter of months. If you grind many carbide tools, you are actually paying for a Hammond Electrolytic Grinder, therefore — *WHY NOT USE IT?*

Write for catalog.

Hammond OF KALAMAZOO "Good Machinery Since '82"

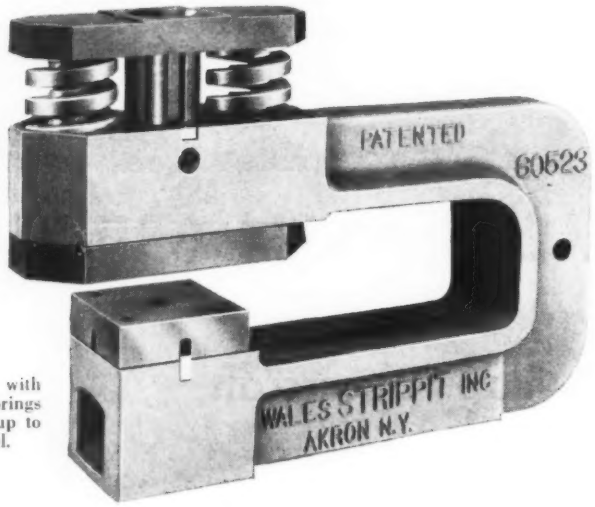
Hammond Machinery Builders INC.

1631 DOUGLAS AVE. • KALAMAZOO, MICH.

CIRCLE INFORM-A-GRAM KEY NO. 27

new STRIPPIT PUNCHING UNITS

with DUAL-RANGE capacity!



● Strippit unit with mechanical springs for piercing up to .500 mild steel.

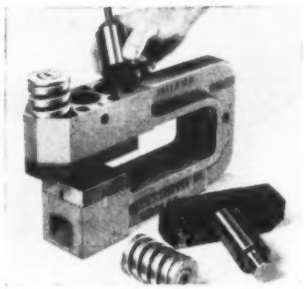
- Up to .500 mild steel, using removable Strippit mechanical springs
- Up to .750 mild steel, with interchangeable Strippit Hydra-Springs
- Convertible from .500 to .750 capacity in seconds, at minimum cost
- One heavy-duty holder for both capacity ranges
- Readily replaceable punch tips and dies — round, obround, square, shaped
- Keyed punch body keeps punches accurately aligned

USING STRIPPIT MECHANICAL SPRINGS

Max. punch dia.	Max. material thickness (mild steel)
1.375	.2[illegible]
1.250	.375
1.125	.500

USING STRIPPIT HYDRA-SPRINGS

Max. punch dia.	Max. material thickness (mild steel)
1.375	.375
1.250	.500
1.125	.625
1.000	.750



◀ Mechanical springs are easily replaced with Hydra-Springs for punching up to .750 mild steel.

WRITE TODAY for the new Strippit General Catalog. It covers all details on this and all other Strippit units... plus the savings in tooling and press time effected with the famous cost-cutting Strippit System of fabrication.

WALES STRIPPIT INC.
212 Buell Road • Akron, New York

UNIT OF HOUDAILLE INDUSTRIES, INC.

Manufactured in Canada by: Strippit Tool & Machine Company, Brampton, Ont.

CIRCLE INFORM-A-GRAM KEY NO. 28

MANUFACTURING MEMOS

Representatives

National Acme Co. has appointed Ellison Machinery Co. of Los Angeles to handle the southern California and Arizona area.

The Minnesota and western Wisconsin territory for The N. A. Woodworth Co. will be served by The Ruehl Machinery Co. of Minneapolis. Sales representatives in the New England area for Colonial Broach & Machine Co. is Wetzel Tool Corp., E. Hartford, Conn.

New Company Formed

The Warminister Fiberglass Co., formed by Fischer & Porter Co. as an independent company, will produce fiber glass reinforced plastic parts.

Coming Events

Sept. 10-11. The Society of Plastics Industry, Inc.'s Midwest Section Conference, French Lick-Sheraton Hotel, French Lick, Ind.

Sept. 13-17. Pressed Metal Institute's Annual Meeting, The Stanley Hotel, Estes Park, Colo.

Sept. 14-16. American Society for Quality Control's 14th Midwest Quality Control Conference, French Lick-Sheraton Hotel, French Lick, Ind.

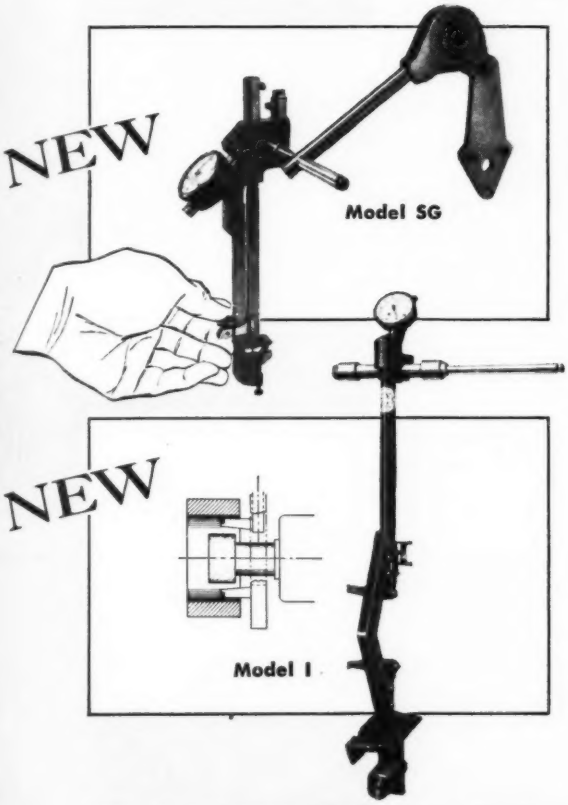
Sept. 14-17. Society of Automotive Engineers' National Farm, Construction, and Industrial Machinery Meeting, Production Forum, and Display. Milwaukee Auditorium, Milwaukee.

Sept. 17-18. American Society of Mechanical Engineers' Engineering Management Conference, Statler-Hilton Hotel, Los Angeles.

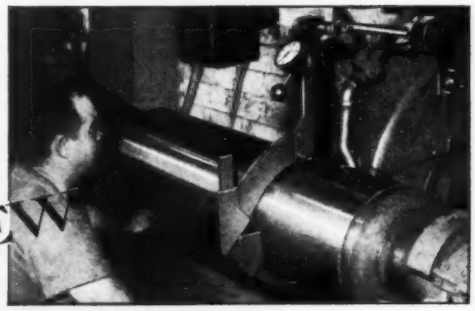
Sept. 20-25. Instrument Society of America's 14th Annual Conference and Exhibit, Chicago Amphitheater.

3 NEW ARNOLD GRINDING GAGES Distributed by FEDERAL

NEW



NEW



NEW

Model LG

Here are three new Arnold Grinding Gages. The Miniature (SG) and King Size (LG) Models now permit continuous measurement for O.D.'s from .060" all the way up to more than 30". And, for the first time, there is an Arnold Grinding Gage to continuously measure I.D.'s. These, like all Arnold Gages, eliminate having to "grind and check". Size of part is shown continuously as metal is being removed, so operator always has positive and precise size control without having to stop his machine until the piece is finished. No oversize regrinds . . . no undersize rejects.

FOR SMALL O.D.'s Model SG

Calipers adjustable from .500" to .093"
Special calipers as small as .060"
Easily adapted to automatic size control of small parts
New style supporting hub

FOR I.D.'s Model I

Checks internal diameters continuously *while* grinding
Contacts adjustable over 1½"
No interference with grinding wheel
Turret-mounted indicator rotates to any position
Easy to position and retract

FOR LARGE O.D.'s Model LG

Continuously measures diameters up to 30" and larger
Single dimension or wide range adjustable calipers
New ball bearing mounting
Rigid, heavy duty frame

ASK FOR CATALOG

FEDERAL PRODUCTS CORPORATION
9239 EDDY STREET,
PROVIDENCE 1, RHODE ISLAND

Ask **FEDERAL** *First*

FOR RECOMMENDATIONS IN MODERN GAGES . . .

Dial Indicating, Air, Electric, or Electronic—for Inspecting, Measuring, Sorting, or Automation Gaging

CIRCLE INFORM-A-GRAM KEY NO. 29

U.S. Press Room Equipment

and F full P profit P potential

U. S. Press Room Equipment is designed for "F.P.P." — to help make press operations more profitable for you . . . to give to each press maximum flexibility and efficiency.

In many cases, press room productivity depends upon the flexibility of your equipment. The wider the range of material your presses can handle, the more productive and profitable they can be. When you combine this wider range of production with increased efficiency, you are approaching a production standard ideal for press rooms.

It is this standard — which has as its aim the realization of Full Press Room Profit for you — that dictates the manufacture and performance of every piece of U. S. Press Room Equipment.

For example, U. S. Slide Feeds are precision built units for the accurate feeding of coil stock into punch presses. They are adaptable to the feeding of one or more separate strips of wire or flat stock, either of regular or **irregular cross section.**

U. S. Flat Stock Straighteners and Two-Way Wire Straighteners are perfect complements to U. S. Slide Feeds. When teamed together they guarantee accuracy and contribute to prolonged die life.

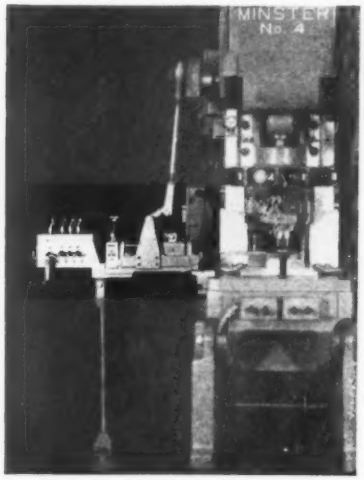
Write today for U. S. Bulletin No. 85P and learn how you can obtain maximum flexibility and efficiency for your present Press Room equipment — to give you your "F.P.P."

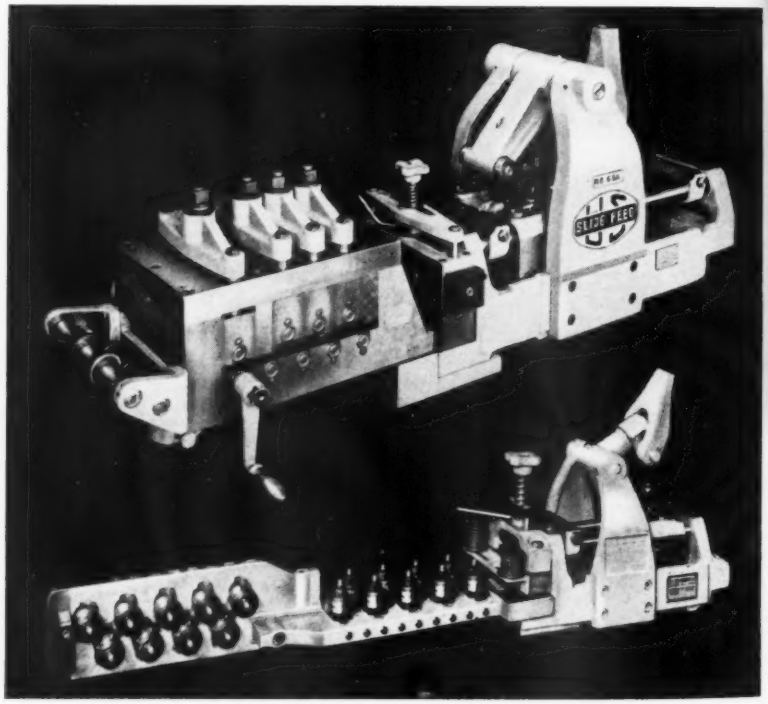
Some typical stock cross-sections readily accommodated by U. S. Slide Feeds.

Below: **SF-1 U. S. Slide Feed with SS-07 Plain Stock Straightener on conventional OBI press.**

Main Illustration Top: **SF-68A U. S. Slide Feed with SS-27 Plain Stock Straightener. Max. width capacity 6" feed length adjustable up to 8".**

Lower: **SF-O U. S. Slide Feed with Two-Way Wire Straightener (nine rolls in each plane).**





PRODUCTS

U. S. TOOL COMPANY, INC.

AMPERE *(EAST ORANGE)* NEW JERSEY

U. S. Multi-Slides® • U. S. Multi-Millers® • U. S. Automatic Press Room Equipment • U. S. Die Sets and Accessories

CIRCLE INFORM-A-GRAM KEY NO. 30

"Been workin' her hard for 14 years ...she's as fast and accurate as the day she arrived".

NIAGARA SHEARS

Precision made Niagara Shears are built to cut with micrometer accuracy . . . *and to keep cutting that way.*

Thousands are in use, but comments are nearly identical. Makes no difference how hard they're worked. Three shifts a day, month after month, year after year . . . a Niagara Shear *continues* to be accurate.

"Don't have to change knife clearance"

No adjustments needed for cutting different thicknesses of stock . . . even at the same time . . . with consistently accurate, burr-free results. *And much longer knife life!* The secret is in the rigidity of Niagara's exclusive box section design. "Upped production 25%," says one user, "because we have fewer adjustments to make."

"Costs less to operate"

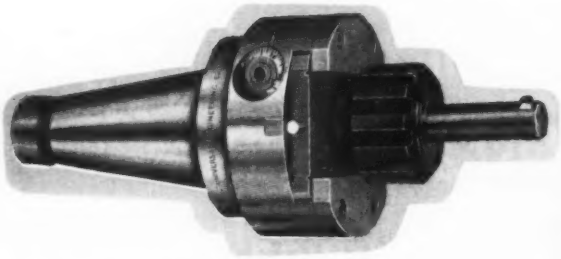
There's less to do, less to learn and less to go wrong. Never even have to worry about damaging the machine by forgetting to change the knife clearance. Once set, Niagara Shears need no further adjustment. "Been using Niagara's for 10 years . . . never had downtime for repairs or maintenance," says another user. Even after long, hard use when it becomes necessary to turn the blades or change knives, it's a very easy matter. Nothing like Niagara Shears for simplicity.

FACT BOOK FOR YOU

Bulletin 69 is filled with customer reports on Niagara Shear performance. You'll value it. Write today.

NIAGARA MACHINE & TOOL WORKS • BUFFALO 11, N. Y. *District Offices and Distributors in Principal Cities*

CIRCLE INFORM-A-GRAM KEY NO. 31



UNIVERSAL BORING CHUCK is heavy and rigid for all types of rough boring without chatter yet accuracy of adjustment adapts it equally well to finish boring. Time-tested Universal Collet nose holds boring tool much more rigidly and securely than set screws while precision and extreme accuracy of feed-adjustment are obtained by an anti-backlash arrangement of feed screw and large dial.

UNIVERSAL RELEASING TAP CHUCK has same basic collet principle featured in all Universal Collet Chucks. Screws or sleeves are not needed and collets are interchangeable with other Universal chucks. Simple, compact design has no springs, cams or pawls to break or wear. Can be used for either right or left hand tapping without adjustment.

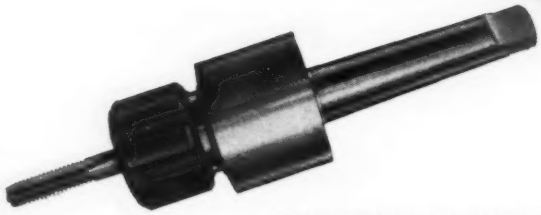
UNIVERSAL
COLLET CHUCKS

combine maximum holding power and minimum run out with simplicity of design and low price

The basic collet principle is the same in all Universal chucks. Tools gripped in these chucks withstand a maximum thrust and radial load because the collet grips on a continuous surface its full length and positively locks the tool. Write today for new catalog showing the complete line of Universal collets and chucks.

HIGH PRESSURE REVOLVING COOLANT TRANSFER CHUCK has standard Universal Collet Chuck nose and a variety of shank sizes can be held by simply changing collets. Minimum overhang is made possible by the single face seal design. Back pressure principle of this design prevents "brake" action thus lowering torque on spindles. Chucks for higher speed and pressures than standard plus a variety of mountings are also available.

210



UNIVERSAL FLOATING COLLET CHUCK for horizontal or vertical operation is positively protected against destructive action of coolant by a seal which prevents entrance of compounds into interior of assembly. Frictionless ball bearing flat springs are adjustable to counter-balance weight of the tool.

UNIVERSAL ENGINEERING COMPANY FRANKENMUTH 8, MICHIGAN

CIRCLE INFORM-A-GRAM KEY NO. 32

ARE YOU READY WITH THE ANSWERS

Threadwell
MAKES THE BEST PRODUCT BETTER

INDUSTRIAL DISTRIBUTORS THE RIGHT HAND OF PRODUCTION

Threadwell Field Men and Distributors Can Help You in Production Planning

When your next order involves multiple or complicated machining operations, and you've got your processing and production equipment all lined up, make sure you insure your investment by putting Threadwell cutting tools in those holders. They'll provide the uninterrupted high quality production all your machine tools are designed for.

Before pushing those buttons, check with your Threadwell Distributor. His experience and advice costs you nothing

THREADWELL TAP & DIE CO.
GREENFIELD, MASSACHUSETTS

Stocking Warehouses: New York — Cleveland
Detroit — Los Angeles — Greenfield, Mass.

CIRCLE INFORM-A-GRAM KEY NO. 33

ERICKSON

QUICK CHANGE HOLDERS

...for use with your standard MMS tapered tools ...designed for presetting of tools

Now you can use your present standard MMS tapered tools with the *new* Erickson Quick Change Holders. That means you get the double production advantage of Erickson's *high precision coupled with the rapid change feature.*

Several different models comprise the line: Morse taper holders for boring mills and radial drills, milling machine holders that fit standard spindle tapers, turret lathe holders that increase turret lathe tool-holding capacity, straight shank holders with #30 or #40 MMS socket. These holders take Erickson Collet Chuck milling machine adapters in both regular and heavy duty types, end mill adapters, shell and face mill adapters, Morse taper adapters, boring head adapters, and chuck adapters for Jacobs internal taper.

AA-7455

A call or card will bring the Erickson representative on the double. Meantime write for your copy of Catalog G "Erickson Quick Change Holders."

ERICKSON TOOL COMPANY

34451-9 SOLON ROAD • SOLON, OHIO

COLLET CHUCKS • FLOATING HOLDERS • TAP CHUCKS • TAP HOLDERS • AIR-OPERATED CHUCKS
EXPANDING MANDRELS • EXPANDING-COLLETS • SPECIAL HOLDING FIXTURES

CIRCLE INFORM-A-GRAM KEY NO. 34

AUTOMOBILE HISTORY IN THE MAKING

THE NEXT SIXTY DAYS will see the opening chapters of a New Era (remember the New Era car, about 1912?) in automobile history.

The introduction by the Big Three of their "compact" or "economy" cars will give future historians a bench mark from which to survey what may well become another revolution in the American public's relation to and support of the automobile industry.

The fortunes of a supply industry vary directly as its consumer relationship meanders between the extremes of enthusiasm and apathy. The introduction of the compact car is a move to combat signs of increasing consumer resistance to the status quo.

The automobile price pie has always been cut into three major servings — low-priced, medium-priced, and high-priced. As a result of projecting its continuing market analyses of consumer wants and buying power into the successive postwar model year concepts, Detroit's medium-priced slice has become a little too big for the number of consumers with that degree of appetite.

The historians will point out that this has been a gradual, creeping transition, first evidenced as the "low-priced three" ceased to be low-priced. Detroit's marketers noted that as we consumers signed on the dotted line for our Fords, Plymouths and Chevrolets, the top of the sales invoice was filled with extras, options, horsepowers, pushbutton accessories, fancy trim and two-tones. Thus we, of our own volition, served ourselves a middle-priced slice of the pie.

The historians will say, "Then came the Edsel." And, that for the increasing number of consumers who, due to the onsetting inflation, were watching their dollars, the Edsel was a symbol — simply one more car crowding the already overstuffed, middle-priced slice of pie. Something had to give.

Looking in their rear vision mirrors, the historians will record that Detroit was doing quite a job of ignoring the invasion of its market by the small and economical foreign car.

For a while Detroit thought it had an astute and impelling answer to the low-priced, economical car question. "We have the best, low-priced, economical transportation the world has ever seen. Just visit your used car dealer!"

That answer didn't take. Neither did the Big Three's stripped, $1825 models; the austerity jobs — the salesmen's coupes. There was something else, but what was it?

Detroit's medicine men took to rationalizing the little foreign car as a "status symbol." There was always the fellow who wanted to be "different" but who couldn't afford to be different enough to drive a Rolls-Royce. He satisfied his difference ego by running around in a sportishly little foreign job that caused people to look twice.

Detroit found little aid and comfort in pursuing that line of reasoning in the face of ballooning foreign car sales — from hardly a statistic in 1955 to almost 100,000 in 1956, upping to 375,000 for 1958, and a prediction crowding 500,000 for 1959. Could there be that many people who simply wanted to be "different?" If there were, they were beginning to take on the complexion of a mass market, and Detroit wanted in.

Historians like to find the straws that break camels' backs. They will add to this the phenomenal success of American Motors' Ramblers and the accelerating acceptance of Studebaker-Packard's Lark, and say that Detroit finally realized that there's a mass $ market made up of people who want a serving of the low-priced slice of the pie.

This is the market that Detroit was kissing goodby, but is now setting forth to woo with a vengeance with it Valiants, Falcons, and Corvairs.

Particularly, what is of vital importance to us, individually, is what the historians will have to say about the impact this impending revolution had on the used car business. What they will tell is what happened to all of us — we're all driving used cars.

Next to U. S. currency the used car is undoubtedly the "circulatingest" medium of exchange in this country. It represents the only dollars we have to show from our last trade. What is going to happen to those dollars?

If the used car market becomes depressed by virtue of used cars having to be sold for less, we will be the ones hurt because the dealers will give us less for our current cars. If the shakedown is relatively sudden, the dealers will be hurt dollar-wise only to the extent they are caught with a used car inventory.

They'll carry on, buying for less (from us) and selling for less. They'll maintain the mark-ups and/or percentages necessary to conduct their business. So we, the "first pre-revolutionary generation" of car owners are apt to take the beating; we are the guinea pigs. It may take us three or four trades to regain our automobile dollar equilibrium, so-called.

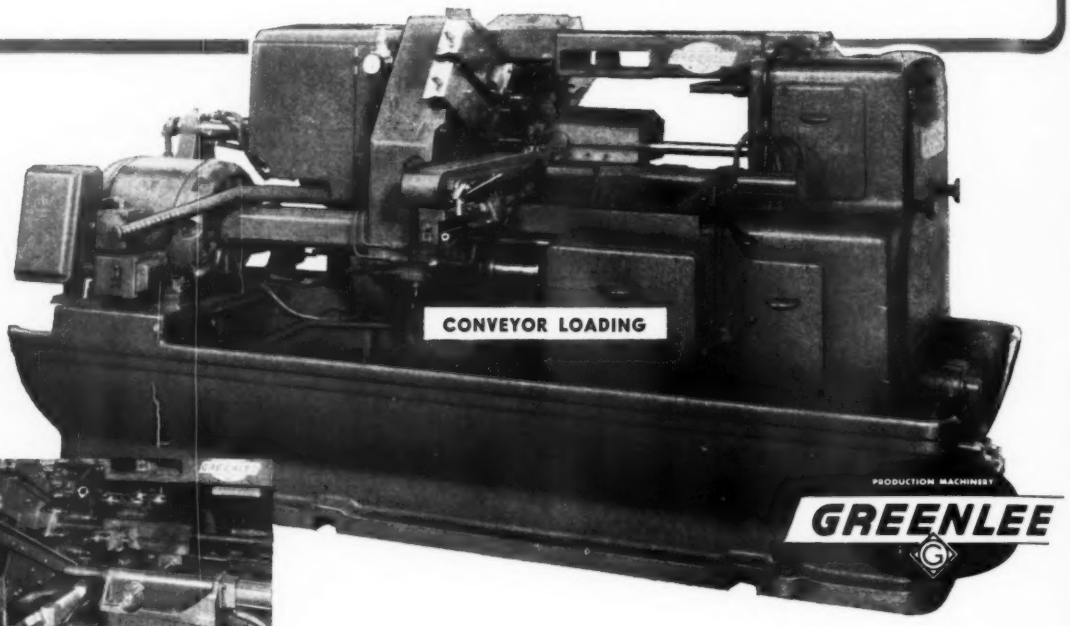
It could be that at least one of us (E.W.P.) won't make a trade until he's gotten the last dollar and last mile out of his present high-priced, low-priced three-er.

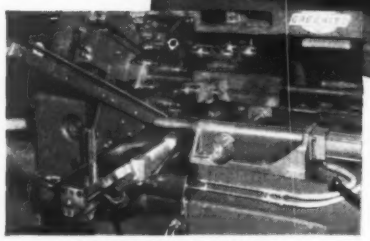
We are neither historian nor prophet. All we know for sure is that for our favorite industry, the automobile, there are no dull days ahead!

E. Willard Pennington

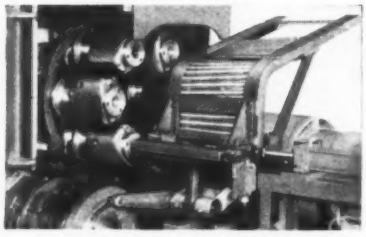
Editor

Second Operation





MAGAZINE LOADING



REAR LOADING MAGAZINE

HAND LOADING

A Method of Machining That Pays Off

Greenlee standard Automatic Bar Machines, adapted for second operation work, profitably machine a wide variety of parts. Long shafts or short pieces are automatically loaded into the work spindle by any of the various loading arrangements shown. Parts are loaded in one position during the machining cycle, and machined in the remaining five cross slide and end working positions. For more information, see your Greenlee Distributor.

GREENLEE STANDARD AND SPECIAL MACHINE TOOLS

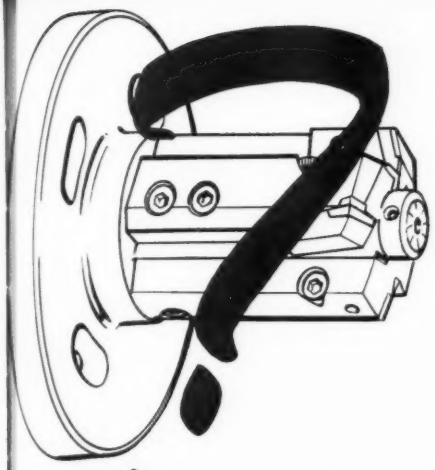
- Multiple-Spindle Drilling and Tapping Machines
- Transfer-Type Processing Machines
- Die Casting Machines
- Six and Four-Spindle Automatic Bar Machines
- Hydro-Borer Precision Boring Machines

WRITE FOR CATALOG No. A-405

GREENLEE BROS. & CO.

1744 MASON AVE. ROCKFORD, ILL.

CIRCLE INFORM-A-GRAM KEY NO. 36



carbide TOOL NEWS

What do you get when you buy a cutting tool?

- **DELIVERY?**
- **ENGINEERED DESIGN?**
- **QUALITY?** • **ACCURACY?**
- **TROUBLE-FREE OPERATION?**
- **LONG LIFE?**
- **PERFORMANCE?**

You may expect many things, but what you get is what counts. When you buy "Wesson" you actually get all of them—but, more important, you get real SERVICE.

That's not just a claim. Here is a typical example to show how Wesson SERVICE works full time—before, during and after the order.

A TYPICAL PROBLEM

For years, the high tool cost of boring crank ends of automotive connecting rods was a problem. All cutters tried were hard to grind and even harder to set up. They had to be frequently dismounted to make needed adjustments.

THE WESSON SOLUTION

Full time Wesson Service Engineer Burt Dupuis was in a large engine plant looking for problem spots. The crankpin machines caught his eye. Burt got an idea. He sketched it out and sent it to Wesson engineering for detailing and to prove it out on paper.

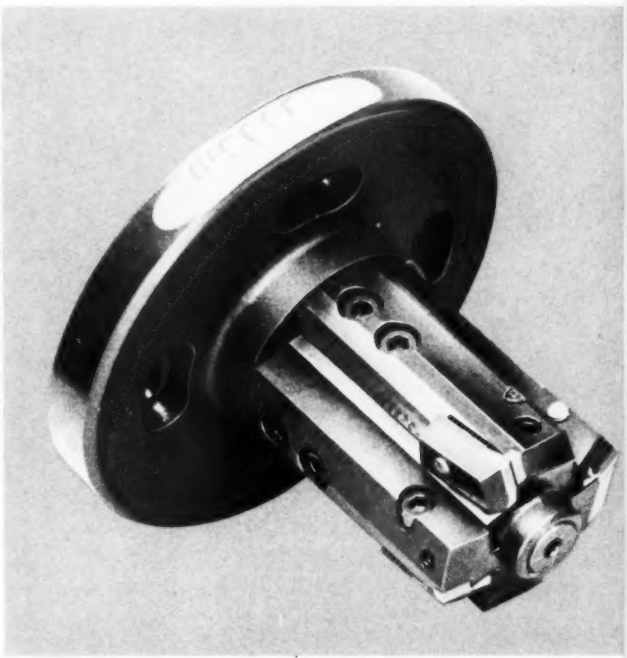
The blueprint decided the company to try one cutter. Burt delivered it, mounted it, and watched it cut. He was on the right track. All the cutter needed was a slight refinement. The company still used the original cutters too for a while but they have all been replaced now.

The result? Almost too good. Tool costs are 1/5 of what they were before. For over 2,000,000 holes bored per year, tool costs are only $4,488 compared with $21,058 formerly—**an annual saving in excess of $16,500.**

TOOL COST COMPARISON		
	Former Method	WESSON Way
Consumption tooling (per cutter), $	$20.88	$3.28
Tool cost per part, $	.0023	.0006
Grinding cost per part, $	.0060	none
Set-up cost per part, $	.0022	.0017
Total Tool Cost per part, $	.0105	.0023

THE CUTTER THAT DID IT

Burt's tool uses four throw-away insert holders. Each is replaceable and independently adjustable axially and radially. Two opposed inserts — *(Continued on next page)*



A Wesson Service Engineer developed this crankpin boring tool while looking for trouble spots in a customer's plant. In one pass, it roughs and finishes for a saving of over $1500 per month.

What Do You Get?

(Continued from previous page) rough and two finish so the whole job is done in one pass.

Only the finishers need adjusting on the machine and this is done simply and quickly. Whenever the air gage shows that tool wear has dropped the bores near the low limit, the operator simply turns a cone screw on the tool with an Allen wrench. This resets both finishing inserts to bring the bores back to the high limit. Only when the finishing inserts need indexing (to another of the 8 cutting edges) is a bench setup required. Roughing inserts are indexed on the machine.

Not only do the inserts produce more parts per cutting edge but huge savings result from reduced down time for adjustment and elimination of grinding.

BUT THAT'S NOT THE END

Burt Dupuis still watches this job from time to time to see how it's going. He's already suggested substituting a quick change holder for the present design. This should reduce down time costs even more.

FOR YOU, TOO

That's the way Wesson SERVICE works. And back of it are competent design, service and research facilities to continually improve Wessonmetal and work on advanced tool ideas. Our full time experienced service and sales engineers assist on carbide application test programs. Every Wesson employee provides some service to our customers and prospects. Try it for yourself.

tools Wesson carbide Wessonmetal
WESSON COMPANY, DEPT. AD
1220 Woodward Heights Blvd., Detroit 20, Mich.
IN CANADA:
WESSON CUTTING TOOLS, LTD.
93 Judge Road, Toronto 18, Ontario

Wesson Tracer Turning Tools Made Standard Line

FOUR DIFFERENT HOLDERS ALL USE SAME 4 SPARE PARTS AND STANDARD 55° DIAMOND-SHAPED THROW-AWAY INSERTS

STYLE DAL-C

Style DAL-C tracer turning tool cuts from left to right. Its mirror image, Style DAR-C, cuts from right to left. Style DTRL-C is symmetrical and cuts either way. For Fischer lathes only, Style MX-8-T5C cuts from right to left.

Introduced as specials three years ago, these Wesson Multicut holders have been designated as standards in recognition of their acceptance.

They can be used on most machines for tracing, out-facing, plunge-turning, recessing and undercutting.

Whatever your tracing needs, these holders are available from stock, and the carbide inserts, in various grades, have also been made standard. These holders have all the advantages of throw-away insert tooling plus the big advantage of standardized, interchangeable parts for all four styles.

Write for Bulletin #159.

Conventional Carbide Tools Best Bet For Most Jobs

2. *"Throw-away" milling cutters*

The Wesson "wedge-behind" series of milling cutters with throw-away carbide inserts are now classed as conventional tooling and they have demonstrated production ability on light, medium and heavy cuts on cast iron or steel. These cutters are designed for lowest cost per edge on most rough and semi-finish milling operations.

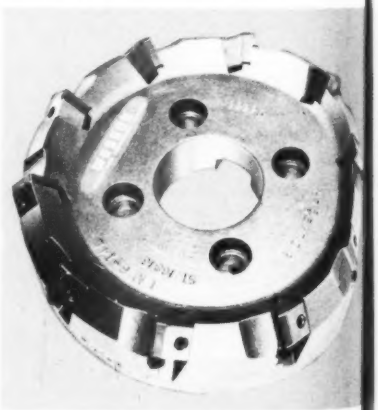
Indexable throw-away solid carbide square inserts eliminate the need for grinding, provide 8 cutting edges and permit at-the-machine cutter maintenance. A precision pin and the V-block principle of insert seating-location achieve uniform blade location easily. Total runout of blade slot is within ±0.0003 inch.

The wedge behind the insert provides full support and protects the cutter body in case of smash-ups. Inserts can be changed quickly because the wedge rides up and down on the actuating screw as it is turned.

These cutter series are immediately adaptable to present machines and adaptors without heavy expenditures for conversion.

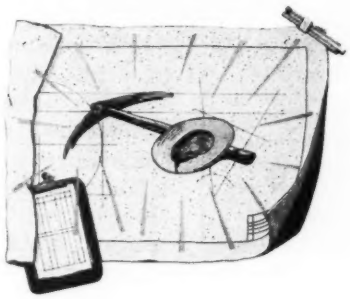
Next time you have a milling operation to set up, consider these cutters. To be ready with data:

Write for Bulletin #M-358.



Special Feature Section:

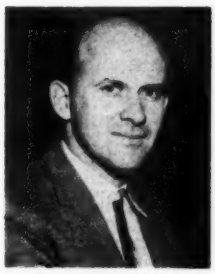
Pay Dirt Economics



NO ONE EXPECTS YOU, the manufacturing executive, to be a graduate economist. Nevertheless, you're continually called upon to juggle men, machinery, materials, and money in an effort to boost productivity and profits. To help you make these manufacturing-oriented economic decisions more quickly and profitably—to guide you to "pay-dirt" — Tooling & Production Magazine presents this special editorial round-up of usable ideas and answers to in-plant economic problems.

Value Analysis

A Cost-Cutter Any Business Can Use



*by Roy E. Fountain**

IN A MANUFACTURING BUSINESS value can be defined as the lowest price you must pay to provide a reliable function or service. Value analysis, then, is the scientific evaluation of value, just as we analyze weight, performance, or quality. It is an approach aimed at getting the same or better performance at lower cost without any deterioriation in quality. More than that, value analysis is a philosophy that applies to all functions in a business and to all businesses, large or small. Here is a sampling of value analysis results:

- The cost of a J-bolt was reduced from 11½¢ to 1½¢, for a total saving of $80,000.
- The cost of a hinge was reduced from 25¢ to 17½¢, for a total saving of $39,000.
- The cost of an electronic filter was reduced from $35 to $7, for a total saving of $11,000.
- The cost of an arcing horn was reduced from $7 to $3, for a total saving of $11,000.

The Functional Approach

The basic value analysis technique is probably the functional approach. What is the part or assembly? What does it do? These are the most important first questions to ask. Then, what else will do the job, and what would that cost?

For example, what is the value of a small bolt in an airplane wing if failure of that bolt would cause the plane to crash? What is the value of the brakes on your car, which you use in one situation to park your car and in another situation to avoid a four-car collision?

Value has no relation to the actual cost of producing a part or device, nor does it necessarily have any relationship to the consequences in the event of failure of that part or device. The value of a bolt in an airplane wing is determined by the lowest cost means of providing the function required. If the cost of a bolt is 25¢, for instance, and the bolt is found to be too small, the size might be increased and the cost

*Engineer — Advanced Value Research, Value Service, General Electric Co., Schenectady, New York.

In 1947 General Electric began a broad study of value. It began modestly as a one-man project in the Purchasing Department. The engineer assigned to the job was Lawrence D. Miles, now manager of Value Service. He envisioned value analysis as an intensive study by Engineering, Manufacturing, and Purchasing to determine all possible ways of eliminating costs which did not contribute toward making the product work or sell.

It has expanded into a company wide activity that is cutting millions of dollars from product cost, and at the same time improving quality and reliability. A survey shows that for each value specialist employed in a department the added earnings (before taxes) range from $200,000 to $1,000,000 annually. The survey also indicates that much greater savings can be accomplished when the techniques of value analysis become an integral part of all functions involved in product manufacture.

might become 50¢ or $1, but never will the cost (or the value) be equal to the cost of the plane or the value of the pilot's life. Similarly, the value of the brakes on your car is established by the lowest cost at which braking may be reliably provided.

In analyzing a product the value analyst scrutinizes every part and every operation involved in its manufacture. He learns all he can about the necessary functions as established by Engineering—and then temporarily forgets all the standard practices used for obtaining these functions. He starts from scratch with such questions as: "Does the use of this part contribute to value? Is its cost proportionate to its usefulness? Does it need all its features? Will another dependable supplier provide it for less?"

He talks to scientists and engineers to learn what new low-cost material can possibly be substituted without sacrificing quality, or what new ideas make the use of existing materials or processes practical. He enlists the ideas of specialty vendors or helps them develop ways of reducing their own production costs. He meets with manufacturing men to investigate new tools and processes, and to make sure that the improvements he is suggesting are practicable from a manufacturing standpoint.

The Human Element

The application of value analysis is not a factor of the kind of business, or the area within a business, or the quantity of articles produced by that business. Rather, it is a question of recognizing and knowing what value is, how to analyze it, how to change people's concepts of it through training, how to use techniques and information to overcome the kind of thinking forced unconsciously upon us.

It must be remembered that human beings are involved in the development of each idea; more specifically, human attitudes are involved. Unfortunately, many decisions are based not on facts, but on what people think the facts are. Many decisions are made with necessary information lacking.

A value analysis program seeks to change traditional "it can't be done" attitudes by providing new (and more) information at the point of decision. This philosophy is taught to groups of employees so that they can benefit from the thinking of others and better understand their own actions.

Value analysis must be kept from becoming just another name for cost reduction by making certain that men actively engaged in it are qualified and well-trained. The goal of everyone in the value analysis activity is to improve the cost reduction effort by removing big costs instead of merely 5% or 10%. Such savings can be developed through training courses with "live" projects.

The value analysis creed of "the same performance at vastly lower cost" has been applied successfully in thousands of cases. In today's tightly competitive market value analysis can, and often does, mean the difference between making a profit or going out of business.

end

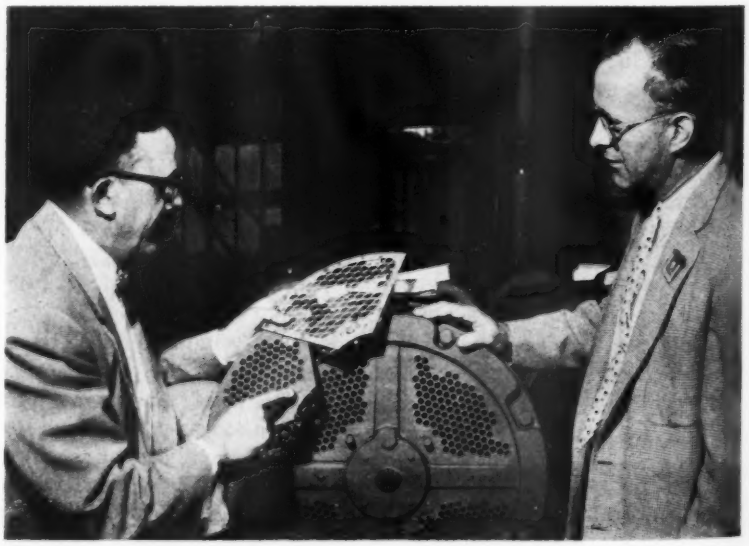


Fig. 1. Value analysis improved a motor screen and lowered its cost. Old-type two-piece screen (shown at top) cost $6; new one-piece stamping, $1.62.

What's a Man-Hour Worth?

$5.25, or about twice your average hourly wage, is the figure to use for most shop decisions.

*by B. T. Fullerton**

A NEW TYPE OF CUTTER, which will cost 5¢ more per machined part, will save a minute of machining time per part. Is it worth it?

One thousand new parts to be manufactured can be tooled for $500 or for $2500, the latter saving 300 hrs. Which should it be?

This freer machining steel costs 3.5¢ more per piece and saves an hour per 100 pieces. Should we use it?

A proposed new method will save 400 direct labor hours annually with a capital investment of $5,000. Is this enough of a saving to make it worthwhile?

These are typical of the questions you are confronted with every day; questions of "cost" vs. "saving," dollars spent vs. dollars gained. Most of them involve relatively small amounts of either cost or saving and should be decided "on the spot" by the various operating people who are faced with them.

Different factors affect each decision, but one main factor affects them all—the value of the man-hour. My own experience in capital goods selling leads to the belief that there is tremendous and unnecessary confusion about this value. Present accounting practices in most shops are not set up to give the correct figure. Their main purpose, of course, is to arrive at a cost of the product, an over-all cost figure that can be used for profit and loss purposes. The more sophisticated systems are used in detail for product pricing and for budgeting or cost control within departments. These do not attempt, however, to put a figure on the value of a man-hour because in most cases it has not been asked of them, and possibly because of a lack of agreement between the cost and shop people as to what is required.

"The" Shop Figure

What is needed is one figure for use by all operating people—engineers, tool designers, superintendents, foremen—for all shop departments. It is obvious that the value will not be exactly the same for the milling department as for the turret lathe department, or the tool room or pattern shop, but it will be near enough to be usable in most, if not all, instances. It need not be correct to the nearest penny or even the nearest dime because the information on which operating men make economic decisions is not that accurate.

Starting with the definition that "the value of a man-hour is the sum of all those costs that are incurred specifically because you are using up a man-hour," we have found it to be worth $5.25. In other words, it is equal to the direct wages, fringes, etc. paid the man, plus those portions, taken as averages, of indirect costs and overhead **which vary as the number of men or man-hours varies.**

Table I shows a breakdown of these individual costs, as figured for Warner & Swasey's turret lathe department. Both direct and indirect costs are included. The indirect (labeled "additional") costs are of two types—those which apply to the man-hour itself, and those which are incurred if the man-hour also represents a machine-hour.

The direct costs are self-explanatory. They can reflect the average for all operations in a company or, as in our case, the average direct costs in a typical department.

It has been widely accepted that it is possible to take credit for saving a fraction of a man's time in any cost saving decision.

*Director of Marketing Services, Warner & Swasey Company, Cleveland, Ohio.

Dollars Saved by a Man-Hour Saved

(based on W&S Turret Lathe Dept.)

Costs Applying Directly to the Operator		
Average Hourly Wage	$ 2.56	
Average Hourly Incentive	.30	
Average Shift Premium	.06	
Retirement Fund	.18	
Vacation	.24	
Social Security	.10	
Workmen's Compensation, Hospitalization, Insurance	.04	$ 3.48
Additional Costs—Which Apply to Man-Hour Itself		
Supervision (average)	.20	
Personnel, Payroll	.04	
Shop Administration	.10	
General Administration	.10	.44
Additional Costs—If Man-Hour Also Represents a Machine Hour		
Machine Cost*	.95	
Maintenance	.18	
Space	.17	
Inspection, Services	.03	1.33
Total Cost of a Production Man-Hour		$ 5.25

We base our calculation on the premise that this works on indirect costs, too, because the number of man-hours of work to be done is no respecter of the fact that each man represents, theoretically, a rigid 40-hour week.

Practically speaking, fractions and averages of savings must be counted because if you don't count them as they happen you never will count them even when they finally add up to a whole. It is impossible to keep track of — ahead of time — the various production improvements that may be coming from several sources simultaneously. We count, then, the appropriate fraction of Personnel or other costs.

In the case of Supervision, we have found that on an average when a production worker's time is saved only half of the equivalent supervisor's time is saved. (wages and fringes) of 39¢/hr So, out of a supervisory cost per production worker, there is a saving of 20¢/hr for each man-hour saved.

Personnel and Payroll departments bear a pretty close relationship to the number of people in your organization. Using the same principle of averages, we have found that the total cost for all of these services in our plant is 8¢/hr. Since roughly half of our people are production workers, the saving for our calculation is 4¢/hr.

We have found that about half of the cost of the Shop Administration office is applied to the shop itself. These costs, with the appropriate allowance of half saving in Supervision, equals 10¢/man-hour. We estimate that a fifth of General Administration expense is caused by people. With half of the company's people on production work, and half of the Supervisory cost coming through in the form of "savings" per man-hour, as in the case of the direct departmental supervisor, we arrive at the rough variable cost for this item of 10¢/hr.

Don't Include These

There are other indirect costs which vary for reasons other than the man-hour and which should not be included in the figure. The costs of industrial engineering, for example, or standards or methods departments, vary with the volume of new and repeat work put through the shop and not with the time it takes to produce it. No portion of these costs is "saved" when a man-hour is saved, and therefore no credit can be taken for them.

A saving in machine hours for a given volume of production tends to reduce the number of machines required. When machine hours are saved, so are a portion of maintenance hours, space, and inspection and services. These savings total $1.38, as shown on Table I.

In most cases, man- and machine-hours are saved equally, and the entire value figure ($5.00) should be used. There are cases, however, in which the man-hour savings are based on a change in the number of machines which a man operates. Because there is no increased production per machine the man-hour costs, only, should be considered and the costs of the machine, maintenance, space, and inspection and services should not be included in the calculation.

In making machine replacement calculations the machine cost is not applicable because you are not saving any capital investment because of the cost improvement.

So, Double the Wage

Basic data for the figures in Table I were obtained with appropriate adjustments from Warner & Swasey accounting department figures, but there is no real need for you to do the same. The $5.25 man-hour valuation is near enough an average to be usable in most, if not all, production departments. For shops where costs are considerably higher or lower than those in Table I, you probably won't be too far afield if you double your

*Machine Cost includes average capital replacement cost ($25 000 Investment divided by 40,000-hr.—or 10-yr, 2-shift — use), plus the cost of alternate use (investment or saving) of an amount equal to the average investment in the machine.

This machine cost is not applicable in machine replacement calculations because you are making, not saving, a capital investment. For machine replacement calculations, use $4.30 as the value of the man-hour ($5.25 — .95 = $4.30).

average hourly wage and use that figure as the value of a man-hour.

Basing your calculations on the "value of a man-hour" the problems posed at the beginning of this article, like many shop problems, can be solved quickly, and accurately enough to enable the plant supervisor to make reasonable economic decisions. For example:

1. The new type cutting tool that costs a nickel more per machined piece but saves a minute of machining time per piece is worthwhile. Because the man-hour is worth $5.00, the minute saved is worth approximately 8¢. The tool in question costs only 5¢ more per piece, so there's a 3¢ saving on each piece when the new tool is used.

Editor's Note:
This is similar to the reasoning behind Kennametal, Inc.'s current campaign, "Don't Waste Dollars in Your Machine Output to Save Cents in Longer Tool Life." Minutes and hours of stop time are usually worth more than the cutting tools being used. So, Kennametal says, for economy's sake it's smarter to utilize the man and machine at or near top capacity and not worry about tool life.

As a starter, they recommend speeding up machining operations to reduce tool life to about 30 min. A greater or lesser reduction can be made from that point, depending on results obtained, machine capacity, workpiece, etc. These speeded-up operations are based on use of throw-away tool bits — whereby tool regrinding and re-positioning, along with downtime associated with it, are eliminated.

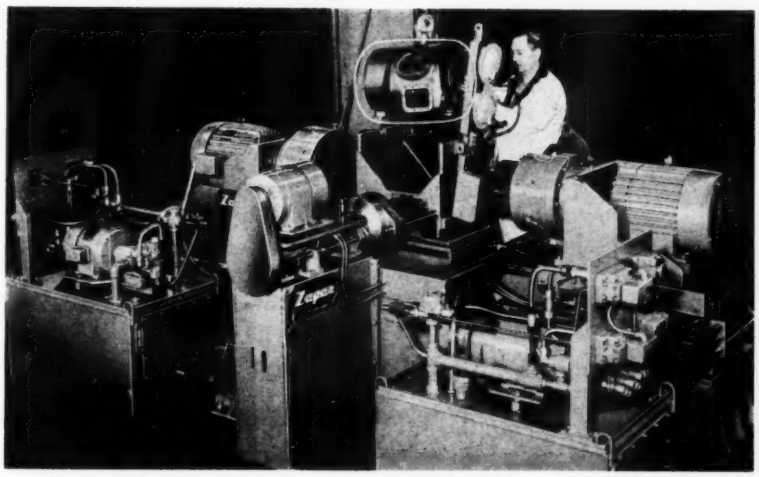
2. A man-hour is worth $5.00, so the 300 hrs saved by the $2500 tooling is worth only $1500 in savings. Unless there are substantial savings besides man-hours, the $500 tooling is more economical.

3. The freer machining steel, costing 3.5¢ more per piece and saving an hour per 100 pieces, is worthwhile because the saving in man-hours alone amounts to 5¢ per piece.

4. The proposed new method that will save 400 direct labor hours annually with a capital investment of $5000 is worthwhile. In this case, since there is an additional capital investment required and you're not saving any capital investment because of the cost improvement, the value of the man-hour should not include the "Machine Cost" and is rounded off to $4.00. The savings from the proposed investment is $1600 per year in man-hours, and added to this are other specific savings which may be obtained from other costs. So, the investment in new equipment should be made.

end

Single Heads Drill Varied Hole Patterns



A varied hole pattern installation uses new heavy-duty 20-hp feed units introduced by Zagar, Inc., 23894 Lakeland Blvd., Cleveland 23, to drill a total of 108 holes.

The unique fact is that three different drill patterns are drilled by each of four drill heads. The changeable patterns are made by removal of the non-operating drills when the casting and fixture are changed from one job to another.

Accommodation for more than one pattern of drilling and tapping is allowed for when designing the machinery. Drill heads are located in the form of a cross, permitting the casting to be drilled simultaneously from four sides.

Valuable Reprints for You

Industry Agrees on "Building Block" Standards
by William E. Hoffman

Your Guide to Heat Treating Equipment
by Charles Weiner

For single copies, write the editor, Tooling & Production Magazine
1975 Lee Road, Cleveland 18, Ohio

Tax Saving Techniques

*by Andrew F. Oehmann**
and
*Richard L. Braunstein**

THERE APPEARS TO BE SMALL HOPE for federal tax reduction in the foreseeable future. Under Secretary of the Treasury Fred C. Scribner, Jr., recently stated, in an interview reported in Nation's Business magazine, that:

> "We are just concluding the fiscal year—fiscal year '59—with a federal deficit in the magnitude of $12.5 billion. It is understandable that we should not become too encouraged about a sizable tax cut in the near future."

If current tax reduction or saving is to be effected, therefore, it must be done by taking full advantage of whatever benefits may be available under the provisions of the Internal Revenue Code, such as deductions which reduce income subject to taxation or narrow the tax base.

Deductions for depreciation come within this category. During the same interview Mr. Scribner also pointed out that:

> "There is, however, a good deal of misunderstanding, I think, about the depreciation area. You are entitled on items which you use in your business to take the depreciation which actually reflects your business experience. If you use a piece of equipment and it is worn out at the end of five years and abandoned with no salvage value, you can depreciate over five years. You can do that regardless of what the experience in the industry might be. Bulletin F is only advisory."[1]

Additional Deductions for Depreciation

Under Section 167 of the Internal Revenue Code, which provides for regular depreciation deductions, new and liberalized methods of depreciation may be applied, at taxpayer's election, to property the original use of which commences after 1953. Under these methods the cost of new assets can be written off at a faster rate than was permissible under prior laws, deductions being concentrated in the early years of the useful life of the property. Moreover, there was added to the Internal Revenue Code in 1958, Section 179 which permits a taxpayer to take an extra first year deduction, in addition to regular depreciation, on new or second-hand property.

This additional depreciation deduction is available in one year, the year in which the qualifying property is placed in use. Property which qualifies is tangible personal property having a useful life of six or more years. This includes machinery, equipment and furniture, new or used when purchased, but not land, buildings, inventories, trademarks, copyrights, or patents.

The amount deductible is 20% of cost and the amount of cost eligible for the extra deduction is limited to $10,000 per taxpayer per year, or $20,000 on a joint return. It is in addition to regular depreciation. For example, the sole proprietor, filing a joint return, buys $20,000 worth of Section 179 property in 1959. He gets two depreciation deductions: (1) The Section 179 allowance of $4,000 (20% of $20,000), and (2) regular depreciation under Section 167 computed on a basis of $16,000 ($20,000 less $4,000 of Section 179 depreciation) less salvage value. In 1960 and later years he gets the regular Section 167 depreciation on that property.

Partners are treated as separate taxpayers. Thus, the cost

*Attorneys, Lamb and Long (law offices), Washington, D. C.

[1]Some of the table of useful lives in the Internal Revenue Service's Bulletin F are out of date and a comprehensive survey is being made for the purpose of revising them. The tables are not mandatory but are merely guides to what might be considered reasonably normal periods of useful life. Taxpayers may determine reasonable periods of useful life for their property on the basis of their particular operating conditions, experience, and informed judgment as to technological improvements and economic changes, but must be prepared to substantiate their conclusions. See Internal Revenue Service Publication No. 173 (1955).

limit for a three-partner firm could go as high as $60,000, (all partners filing joint returns with spouses); additional depreciation of 20% on $20,000 for each of the three partners for the first year, or a total deduction of $12,000 would be allowable.

A corporation is limited to a cost basis of $10,000, since it is considered a single taxpayer. A corporation should consider the possibility of using the first year extra depreciation in the following manner:

Assume there are four equal stockholders in a corporation which has already spent more than $10,000 in 1959 on depreciable personal property having a useful life of six years or more. The corporation needs additional new equipment costing $80,000. If the corporation buys it, such property will not qualify for the initial extra allowance since the corporation's $10,000 cost limit has already been reached. Each of the four stockholders (filing joint returns), however, could buy $20,000 worth of equipment in 1959 and lease it to the corporation.

In 1959 each of the stockholders, since he is holding property for the production of income (rent), could take the extra depreciation allowance of $4,000 (20% of $20,000) and also a regular depreciation deduction. In 1960 one of the stockholders could sell to the corporation the equipment he bought. The corporation could then take in 1960 an extra 20% depreciation allowance on up to $10,000 of the price it pays, plus regular depreciation. In 1961, 1962, and 1963, the same procedure could be followed.

This extra depreciation allowance is based on the cash paid for the property. For property acquired in a trade-in transaction, cost is the actual cash paid; the carryover basis of the trade-in property is not taken into account. Consequently, in order to secure the maximum extra first year deduction, outright sale of the old property and a cash purchase of the new property should be considered instead of a trade-in. The benefit of the initial extra allowance is available annually; it may be deducted in each year that qualifying property is purchased and placed in use. If it is feasible, therefore, purchases over the $10,000 or $20,000 limit should be made over a period of more than one year.

There are some limitations on the application of Section 179. In general, trusts do not qualify for extra depreciation; it is not allowed on property acquired by gift or inheritance, or on property purchased from a corporation with which the purchaser files a consolidated return; acquisitions between family members (spouses, ancestors, lineal descendants), between a corporation and a controlling stockholder, and certain others, are not permitted; and the election to take advantage of this deduction must be made by tax-return time. But, no medium-size or small company in need of replacement machinery, equipment, or furniture should overlook the possibilities in this new provision of the Internal Revenue Code.

Eliminating Tax at the Corporate Level

Another provision for tax savings is embodied in Internal Revenue Code Sections 1371-1377, which were also added by 1958 amendment.

These sections permit a corporation which meets certain requirements to elect to be taxed as a partnership, and thus eliminate any tax on earnings at the corporate level. There is no change in the form of doing business—none of the advantages of the corporate style are lost—but the federal tax on corporate earnings, which may be as high as 52%, is avoided.

When an election is properly made, the "electing corporation" pays no tax. Undistributed current earnings are taxed directly to those who are shareholders on the last day of the corporation's taxable year. The shareholders take the corporation's long-term capital gains into their personal returns as capital gain, not as ordinary income. (If a regular taxpaying corporation has long-term capital gain and distributes it to its stockholders, it is ordinary income to the stockholders.)

The individual shareholders receive their proportionate shares of the corporation's operating losses, measured by their investments (stock and debt) in the corporation. This means that the individual shareholder can treat his share of the corporation's net operating loss as one incurred in his own trade or business; he can deduct it from his gross income, use it to offset other income (even though derived from a different business) and can carry the unused portion back and over (but not back to years beginning before 1958). The shareholder can receive tax-free any corporate income which was taxed to him, but not distributed, in a prior year.

Businesses which must operate as corporations, although an unincorporated form is less costly tax-wise, or which cannot change to an unincorporated form because of the tax cost of liquidating, can now continue the cor-

porate form at the lower tax cost of an unincorporated form. Individual proprietors and partners who would prefer to operate as corporations but have not done so because of the higher tax cost, can now switch to the corporate form and continue paying the same tax as in their unincorporated form.

Get "Fringes" Too

Businessmen who have not adopted the corporate form, because it was more expensive taxwise and offered no offsetting advantage, may now want to incorporate for the purpose of getting the maximum tax fringe benefits available to corporate employees, at no greater tax cost than under the unincorporated form. These fringe benefits include exempt sick pay, tax-free reimbusement of medical expenses, accident and health insurance, deductible group life insurance, and coverage under profit sharing and pension plans.

An electing corporation may be used to shift income to children or other relatives without taking money from the corporation and without a double tax. Thus, whereas partnership income can be shifted only by transfer of the partnership interest before income is earned, an electing corporation's income can be shifted after it has been earned by transfer of its stock before the end of the taxable year. Partnership profits are taxable to the partners on the date the partnership year ends regardless of when such profits may have been withdrawn. However, an electing corporation's current profits are taxable to stockholders as of the date the corporation's year ends only to the extent undistributed, consequently, an electing corporation, by timing its dividend distributions, can cause one year's income to be spread over two taxable years of the individual stockholders.

A "one-shot" election (for one year) could pay off handsomely in special situations. For example, a corporation may anticipate a substantial nonrecurring capital gain. Although this may be a business for which regular corporate operation is generally the preferable tax choice, the stockholder may want to pull the big capital gain out of the corporation and into his own hands if it will cost only a single capital gains tax. The election to be taxed as a partnership for the one year would make that possible, after which the corporation could revert to regular status. Similarly, the corporation may anticipate an unusually large operating loss which the stockholders want to use personally against substantial personal income from other sources, and the same one-year election procedure could be used.

Other Advantages

A corporation could be used to accumulate income until it faces the penalty for unreasonable accumulation of surplus. At this point it could exercise the election, thereby ending the penalty threat and avoiding any further corporate taxation. Also, in a new corporate venture, with the prospect of several loss years at the outset, the stockholders might benefit by exercising the election and using the losses to offset their income from other sources. When the venture becomes profitable the election can be abandoned or continued depending ing upon whichever course produces a tax saving.

In order to qualify for the election, the corporation must be a domestic one, with only one class of stock, held by no more than 10 individuals, all of whom must consent to the election. The one-class stock requirement, of course, limits diversification of the corporate financing; the shareholder limitation of 10 individuals may restrict expansion by increase in stockholders; and the requirement that all stockholders consent could enable a minority stockholder to enforce unreasonable demands by threatening to dispose of stock to an eleventh stockholder or to one who would not consent and thereby terminate the election.

There are other requirements, advantages, and disadvantages (such as a man and wife being considered as two stockholders if either one holds stock) which cannot be fully developed in this short article. However, a corporation which could elect, or a business which could incorporate and then exercise the election described herein, might strike paydirt in a thorough exploration of the possibilities in this relief provision. Since the election must be exercised not later than the close of the first month of the taxable year to which it relates, consideration of the matter should not be unduly postponed.

The foregoing suggestions merely outline the most significant features of the Code provisions mentioned. Resort to them should be undertaken only with careful planning based on expert guidance. end

Carbide Cutting Oil Increases Feed Rate

A new Shell cutting fluid can increase production by at least 25% when used with throwaway carbide inserts. The water-soluble oil, Dromus Oil E, allows a one-third boost in the feed rate across the surface of the workpiece. This higher feed rate, when combined with the proper cutting speed, results in the increased production rate, according to Shell Oil Co.

The new cutting fluid makes faster feed possible because it acts as a coolant and protects carbide tools against breakage due to thermal shock. Designed primarily for high speed production equipment utilizing carbide inserts, the fluid produces cool chips, permits close dimensional tolerances.

Obsolescence Factors

. . . What They Are

. . . Where to Look

*by W. N. Nordquist**

THROUGH THE YEARS the obsolescence of machine tools and other types of capital equipment has become closely associated with age. Other obsolescence factors exist, however, which are not directly related to age. These can be summarized under the term "technical obsolescence"—the relative loss of value created by new and better machine designs.

It often simplifies a mathematical appraisal of machine justification to assume that a machine gets worse each year by the same amount. But, since the machine's operating inferiority doesn't have such a straight-line growth, management cannot rely solely on accounting procedures to dictate how much to budget for new machines, and when and what to acquire. There are many sources of pertinent information and judgment that should be tapped to keep the company equipped to produce maximum earnings year after year.

We should:

- Encourage evaluation of each newly announced machine and process for its potential value to the company.
- Make decisions based upon estimated profitability of the proposed acquisition.
- Take into consideration arguments for the acquisition even though they don't fit into the format of a machine analysis form.

When a company makes much the same product year in and year out, the sequence of operations for a given part or assembly tends to become frozen, even though there may be refinements in the product design. Very often, the reasons for a particular operation cannot be given. Replacement of a worn-out machine by another designed to do the same work may be wrong; it may be advisable to retire both the operation and the machine.

Just as you should periodically study individual machines, so should you periodically review the process. Carbide milling of steel could provide finishes that possibly would eliminate the need for a subsequent grind. Switching to gun-drilling could not only speed up the drilling operation, but could hold dimensional accuracy and finish sufficiently to eliminate final reaming and possibly even a honing operation. A modern barrel finishing system might replace numerous hand deburring and polishing operations. What pe-

OBSOLESCENCE CHECK LIST

✓	Obsolescence Factor	Indicator
	Machine Deterioration	Excessive machine downtime Increase in cost of machine maintenance Increase in inspection rejects Excessive scatter of inspection data Increase in machine setup time
	Mounting Labor Costs	Increase in Avg. Hr. Wage Arbitrated reduction in time std. Excessive overtime Increase in product selling cost
	Mounting Material Costs	Increase in price of mill products Basic-industry wage increases Excessive scrap
	Introduction of New Mat'ls.	New model designs New product lines Increased R & D activity
	Need for Operator Safety	High accident frequency High workmen's compensation expense High accident insurance rates Low employee morale
	Tightening Quality Req'mts	Increase in inspection rejects Excessive scrap salvage Excessive setup time Re-adjusted industry standards Decline in repeat orders Loss of contracts from old customers
	Changing Market and Product Requirements	Falling sales volume Excessive dealer inventories Stepped-up foreign competition Public opinion—in papers, magazines
	Need for Greater Production	Excessive overtime Present 3-shift operation High cash reserves Talk about needed expansion

*Human Engineering Institute, Cleveland, Ohio

riodical machine replacement survey would have pointed up such needs?

The major factors that tend to obsolete equipment include:

1. Deterioration. As machines age, their wear accelerates . . . up to a point. Downtime for maintenance becomes more frequent and costly; inspection rejects become more numerous; scrap and salvage costs mount. The machine ages more in a year of 3-shift days than in a year of 1-shift days. Replacement of original motor with one of higher horsepower, higher cutting speeds, automatic feeding, and similar modifications contribute to productivity and also to accelerated wear.

2. Mounting Labor Costs. As direct labor costs and burden increase, the influence of a particular machine on the product's unit cost becomes more important. Even though the machine is still performing well, the availability of another machine incorporating more modern features that will substantially raise the operator's productivity (thereby lowering unit cost) will make the existing machine obsolete.

3. Mounting Material Costs. The cost of most raw materials is now considerably higher than even five years ago. Product redesign often necessitates the use of specialty metals that come at a higher price. The necessity of holding the material factor in the unit cost may obsolete a screw machine in favor of a swaging machine or cold header.

4. Introduction of New Materials. Some of the newer materials for high-temperature and high-strength applications require more horsepower to machine, more tonnage to cold flow. Their introduction to production may obsolete certain present machines or necessitate rebuilding or modernizing. The addition of induction heating units to cold forming equipment to induce better metal flow is one example.

5. Need for Operator Safety. The cost of workmen's compensation is quite high in certain industries and plants. This, coupled with union demands and a continually more magnanimous attitude of employers toward employees, makes it imperative that the safest possible equipment be used. This could be a major factor in obsoleting present press-working, welding, or casting operations of a manual nature.

6. Tightening Quality Requirements. Dimensional tolerances, surface specs, and assembly fits have become closer and closer in order to meet higher performance requirements of the end product. You've heard a lot about the magnitude of savings to be gained by automatic assembly and these cannot be ignored in your drive toward greater cost reduction and increased productivity; yet, the full benefits of automatic assembly can often be realized only by holding closely the dimensions of components that make up the assembly.

Present machines may be obsoleted by these stiffening quality requirements. Most of our machine tools built 10 to 20 years ago were not designed to work to ten-thousandths or to produce 30 to 60 micro-inch finishes. In many plants, on many parts, such requirements—if met at all—can be met only by adding more, and more costly, finishing operations. A good lathe might eliminate one or more clean-up operations.

7. Changing Market and Product Requirements. Aside from the influence of closer tolerance requirements, which can be an immense factor for the contract shop which suddenly finds itself unable to compete on a quality basis, and aside from the introduction of new materials that require bigger and more rigid machines, we have a rapidly changing technology and continually shifting markets.

When technological advances threaten to permanently idle whole batteries of machines, does it not make sense to replace the machinery if it isn't adaptable to other product lines—replace it with equipment to produce a marketable product?

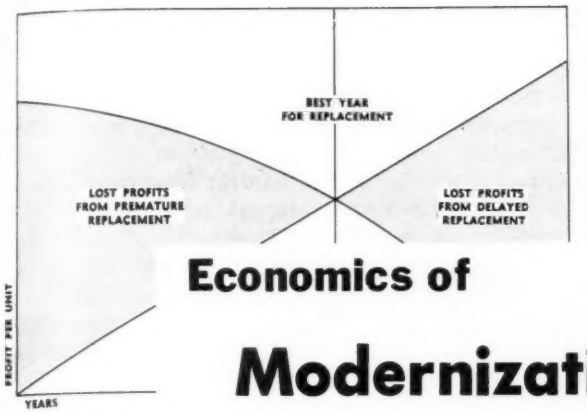
Domestic gas ranges, the straight six-cylinder automotive engine, the upright vacuum cleaner, the reciprocating-piston aircraft engine and many other products have been hard hit by radically new product designs. Foreign competition has already had its toll on our production of bicycles, sewing machines, watches and clocks, and cameras. Many of our plants have been equipped to make specific products, and the competition of new designs and lower prices has virtually obsoleted the existent equipment.

There should be a constant management search for factors that may necessitate re-orientation as to product design and markets . . . and possibly the abandonment of old lines that have been steadily losing favor.

8. The Need for Greater Production and Expansion. We are facing, in the 1960's, a tremendous growth in consumer needs, along with a decided manpower shortage. When a company has just so much floor space and equipment, and orders are piling up, it can grow by expanding its physical plant or by further increasing the productivity of its present equipment.

During 1955 and 1956, many companies had this choice, and chose to expand. In some cases, they might have better invested the same capital or less in updating their equipment. When more production becomes a demand, every piece of equipment becomes a critical potential bottleneck that deserves careful evaluation.

These eight items constitute the most significant factors in machine obsolescence. Although they cannot be given universally accepted dollar values, they should be reviewed regularly in the light of your operations and facilities. end



Economics of Modernization and Expansion

*by Ralph E. Cross**

ONE OF MANAGEMENT'S PRIMARY RESPONSIBILITIES and most challenging problems is profitable capital investment for modernization or expansion of production equipment and facilities. In few other areas are there less sure-fire answers to the maze of variables that make up capital investment decisions.

Such problems keep executives in a constant turmoil, since the decisions rendered may well represent the difference between corporate success or failure, and the difference between prosperity or depression for their employees. Such high stakes leave little room for error. Yet, the human element, with all its shortcomings, is more dominant here than in any other business activity.

Investment proposals are complicated in several ways, including the "intuitive" appraisal of a multitude of secondary factors and data relating directly to the need for decision, and the method of evaluating or comparing alternate investment proposals.

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Secondary factors that materially influence capital investment decisions relate primarily to competitive status, sales, accurate forecasting, price trends, design trends, and projected product design life. No formula, equation, or nomograph exists that will provide the right answer to these variables. The only constructive approach to these "related" factors is to make sure that all the facts have been studied to ensure the highest degree of accuracy in the "intuitive" decision. Where all the facts are not complete or accurate the risk of the next step—the investment decision will be compounded beyond all reasonable proportion.

Understanding Investment

A capital asset is a reservoir of valuable future services. Like the energy in a storage battery, these services are drawn off and consumed over a period of time.

There are two values to be considered when appraising a capital asset—capital value and service value. Capital value is the market value or cost of the asset. The service value is the value of its future services.

When management thinks of these two values, they must think of the service value of a capital asset as the capital value, plus the profits that will be derived from its use over its life span. Or, think of the capital value as the present day discounted value of the asset's future services.

With the exception of land, capital assets are wasting assets. Over a period of time, the future benefits waste away, are eventually consumed, or both. Every time a company produces one of its products, it consumes some of its capital assets. If a company is to stay alive and healthy, a portion of every sales dollar must be used to replace the capital assets consumed in the production of goods.

Theoretically, the consumed capital equals the customary allowance for depreciation. In practice, however, it doesn't work out that way because of inflation, changes in technology, and management's cut-and-try replacement methods. Every company will find that it must

dip into its profits to some extent to make up the difference.

Timing is important. As the service values of a capital asset are consumed and as improved substitutes come into existence, a time period develops in which it is profitable to replace the old with the new. Premature replacement on the one hand, or delayed action on the other hand, will result in losses.

At the beginning of each year, a comparison should be made between unit profits of the existing manufacturing process and profits promised by the most up-to date process available. Of course, unit profit of the existing process will decrease from year to year. By the same token, unit profits from the newest process or equipment available will increase every year. When unit profit of the old and newest process or equipment available are identical, the time for replacement has arrived. To delay will result in losses.

How To Compare

The basic approach to any investment analysis is cut-and-try. There is no sure way of determining an optimum set of conditions that will generate maximum profits. The only course is to select what appears to be the best of several alternative proposals.

The soundest approach is a forecast of return on invested capital. Such a detailed forecast of several operating plans is shown in Figure 1, which compares an existing process for producing oil pump bodies with several alternative proposals.

Plan 1 of the analysis is an old process that has been in operation for many years and is fully depreciated. To meet the production schedule it must operate on a three-shift basis.

Plan 2 is a proposed process comprising a minimum number of highly mechanized automatic machines. It requires the least amount of labor and the highest capital investment. It meets the schedule by working two shifts.

Plan 3 is a proposed process involving a number of inexpensive single-station machines at a minimum capital investment. It requires more labor, tools, etc., than Plan 2, but less than the older Plan 1. To meet production, it must operate on a two-shift schedule.

The comparison shows that Plan 2 will earn $69,358 more than Plan 1 in the first year of operation, after all expenses. It, likewise, will earn $10,332 more than Plan 3, after all expenses.

Which plan would you invest in? The return on the investment for Plan 1 is infinite, since there is no investment at all. The return on the investment for Plan 2 is about 12¼%. The return on the investment for Plan 3 is about 14.1%.

The forecast of return on invested capital is the best way to analyze investments. It is also the most difficult, since many variables affect the result. Some of the variables include such questions as: How long will the investment last? What will the capital value be after the contemplated service values are consumed? How will the cost of labor and taxes change with the passing of time? How much will it cost to maintain the asset over the years? What improved substitutes will be available a year, two years or five years from now? How much will they cost?

Finding the answers to some of these questions makes the problem seem almost hopeless. Actually, there is a reasonable way of approaching this problem. It may not provide an exact an-

Figure 1.

PROJECTED PROFIT AND LOSS STATEMENT OF THREE PLANS FOR PRODUCING OIL PUMP BODIES

Production -- 1,250,000 pieces per year
Estimated life of process -- 8 years

	PLAN 1	PLAN 2	PLAN 3
INVESTMENT REQUIRED	None	1,071,000	850,000
Sales			
1,250,000 Bodies @ 0.82 each	1,025,000	1,025,000	1,025,000
Cost of Sales			
Material	396,000	396,000	396,000
Subcontracting	None	None	None
Direct Labor	187,268	53,328	79,592
Rework	1,500	495	825
Setup & Tool Change	7,434	3,638	5,139
Supervision	20,250	7,000	7,000
Labor Fringes	43,290	12,892	18,511
Floor Space	4,435	5,443	4,760
Power	3,475	6,000	5,100
Taxes	5,000	21,420	17,000
Insurance	1,791	3,750	2,975
Perishable Tools	27,050	18,750	20,100
Supplies	9,200	3,720	3,820
Scrap	26,060	13,480	18,300
Tool Grinding	13,320	7,750	9,630
Machine Repair	15,500	5,100	3,750
Lubrication	3,550	1,250	2,500
Depreciation	None	93,713	74,375
Miscellaneous	28,090	7,999	11,938
	793,213	661,728	681,315
Gross Profit	231,787	363,270	343,685
Selling Expense	66,625	66,625	66,625
Administrative Expense	43,627	36,395	37,472
Interest	None	None	None
Profit Before Tax	121,535	260,252	239,588
Estimate for Federal Income Tax	60,767	130,126	119,794
Net Profit	60,768	130,126	119,794

swer, but will most certainly offer a guide to better capital investment. In the solution of any complex problem, it helps to break it up into parts and to tackle one part at a time. Thus, the problem of capital investment is simplified by dividing it into two parts:

1. A detailed forecast of next year's profit.
2. A projection of this profit into the future.

By following this procedure, it is possible to obtain an overall return on the investment for the life of the project.

Obsolescence, or the availability of improved substitutes, will have a decided affect on future prices. As the facilities age, competitors with more modern equipment will be able to sell at reduced prices. This will tend to depress prices. To what extent will this affect profitability and return on investment? If the company is fortunate enough to keep price indexes for materials, labor and supplies, it can do a sound job of predicting trends.

Management Must Decide

Too often management gives lip service to a sophisticated investment policy, but when it comes to implementing the policy, they revert to old fashioned methods—the course of least resistance. While the primary responsibility for making investment decisions is management's only, management must organize for effective results.

Even though the decision of investment is his alone, the management executive must exercise a high degree of skill in employing a participative approach throughout the processes that lead up to the decision. How well management invests in equipment and facilities is only one measure of a good executive. How well he manages these assets is equally important. In this regard, management must guide and direct participating personnel to ensure complete accuracy of figures and supporting data supplied by these personnel to help him make the right decision.

There is no short cut to effective and profitable capital investment regardless of the approach taken. The penalty for over-simplification so often represented in "the course of least resistance" can be fatal. end

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What About Leasing?

*by Robert Sheridan**

IS LONG-TERM EQUIPMENT LEASING, which has boomed dramatically in the past five years, a fad? Is it a "gimmick" which capital-hungry businessmen have seized upon and which will be discarded when they have tried it and found it wanting?

Last year some $227-million worth of production equipment was leased to U. S. industry, a recession-year gain of 26% over 1957's dollar volume. Metal products manufacturers accounted for $12-million of this total. Actually, this volume is greater because many metal products firms are included in the totals for other industries. When it is remembered that equipment leasing is a new industry that came into existence only after World War II, this volume tells an impressive story.

The reason lies in some economic principles that are as old as the free enterprise system. One of these is that profits are made by use of assets, not by ownership. Another is that profits are made in good part on liquid working capital, multiplied by annual turnover. Any time a company cuts into its liquid cash, it tends to cut into its profit-making ability.

Leasing, however, is no panacea and it has its drawbacks. It is of no value to a firm which has all the operating cash it requires to meet its needs, to a business which has modern equipment in every respect and can compete, cost-wise, with the industry leaders, nor to a business which prides itself on owning all its equipment, buildings, and land.

At the end of 1958, a survey on the rapid growth of equipment leasing cited these eight reasons mentioned by businessmen themselves as to why they leased equipment and were thinking of doing more leasing:

Working capital is conserved. Normal bank lines remain undisturbed. Equipment leasing offers 100% financing, as against a maximum of 25%-80% available through other methods. Equipment is paid for out of before-

*President, Nationwide Leasing Company, Chicago, Illinois.

How Leasing Works

A company wishing to lease equipment submits an application describing itself, its financial position, and the equipment it wishes to obtain. The company selects the supplier and arranges whatever price it can negotiate.

If the company qualifies, the process of delivering the equipment starts the day the papers are signed. Lease payments start when the equipment has been delivered.

Leasing is long-term. Normally it ranges from three to ten years, depending on the company and the size of the lease. Most leases fall between three and five years. Payments can be either equal monthly payments or tailored to any preference of the user and adjusted to any accounting system. Renewal options are available for one or more years.

The cost is the original price of the equipment, plus a small leasing charge. The entire cost is paid in the original leasing term.

All types of equipment can be leased under a single master lease and covered by a single monthly lease payment.

Purchase options are available, but not recommended by Nationwide Leasing Company. The reason is that purchase options can be interpreted by the Internal Revenue Department as converting a leasing agreement into a conditional sales contract. The effect of such an interpretation is to cost the user the benefit of deducting his full leasing charges as an operating expense.

tax earnings rather than after-tax profits. Cost-cutting equipment can be installed immediately to strengthen competitive positions. Tax-timing advantages may result. Leasing provides a hedge against inflation and rapid obsolescence of equipment. Long-term financing is obtained without diluting ownership or control.

How this operates in practice is illustrated by the example of a Chicago metal products manufacturer, a rapidly growing company whose latest balance sheet showed a ratio of current assets to current debt of 1.27:1. This company needed new equipment. After study of the alternatives, the company decided it was wiser to lease than buy.

There was one main reason. This company earns profits on its net working capital at approximately the industry average — 35% before taxes. Its business was growing and every dollar of working capital it could use would, therefore, return to the company 35¢ in profits every time it was used. Since the new equipment would have cost $35,000, the company decided that buying it would cost $12,250 in before-tax profits on the $35,000 purchase price. This was in the first year alone!

This freeing of working capital for more profitable use is the main reason leasing has gained ground in such spectacular fashion. Boiled down, this means that when a company takes liquid cash out of current funds and ties that money up in fixed assets, the company is paying exactly the before-tax profit as its cost of using that money to acquire equipment.

Thus, to decide whether leasing is advantageous, a metal products manufacturer has to figure out (1) what it costs for company cash to be frozen in equipment, as against (2) whether it is cheaper to pay the leasing company to use the leasing company's capital to acquire the equipment.

While this is somewhat an oversimplification, it is still basically true. In general, leasing is found to be most beneficial for those companies whose operations could expand profitably if additional equipment and machinery were available at smaller annual expense than through use of their own capital. Not every company, however, is in this position.

Another advantage leasing offers is the rapid write-off of equipment costs. Consider, for example, a cutting machine that has a depreciable life of 15 yrs (under Treasury schedules). If this machine is leased for a five- or seven-year period, the leasing cost can be written off in the leasing term — five or seven years.

There's nothing underhanded about this procedure. If the lease is a genuine lease and does not include unrealistic purchase options, Internal Revenue regulations explicitly permit the taxpayer to deduct in full all lease payments which are "ordinary and necessary" to his business. This applies to equipment leasings as well as buildings and other property. This rapid write-off is not available if the equipment is purchased for cash on installment, since installment payments are not lease payments.

For companies that find they must replace equipment far more rapidly than government depreciation schedules allow for, leasing provides a legitimate way to deduct the full cost of the machines and to replace the equipment when it is obsolete in terms of production, not in terms of depreciation tables. Smaller companies, as well as industry giants, have begun to use leasing increasingly for this purpose. ■

Nomographs for Determining Lot Size

. . . for Contract Manufacture

*by Seymour Frost**

IN MANUFACTURING A PRODUCT for which the sales can be forecast with some degree of accuracy, manufacturing managers have a well established set of criteria to use in establishing the most economical lot size.

However, the application of these criteria to manufacturing which is done solely on a contract basis, such as is common in supplying defense agencies, has not been so clearly established. The most common approach in this field has been, "We have an order for 60 trajectory controlling doomfizzles, let's make them as fast as we can," even though the delivery requirements are three per month.

The two important factors involved in determining economic lot size where annual usage can be readily forecast are basically: (1) the setup and re-order costs, and (2) the inventory carrying charges.

One Setup or More?

For example, manufacturing the complete year's requirements in a single lot with a single setup would result in a lower initial manufacturing cost than manufacturing several lots during the course of the year, each with its own setup costs.

Inventory Is Expensive

It is obvious, however, that carrying inventory is costly in terms of interest on working capital, rent, light (even air conditioning) and heat of storage space, insurance, obsolescence, and spoilage costs. Even for those affluent manufacturing operations where sufficient fluid capital may be available to maintain large inventories without borrowing, the funds cannot be considered to be available at no cost, for without any effort and little vision the capital could earn 4% or 5% in bank interest or returns on bonds, so that investment in inventory represents profits foregone.

The simple mechanics of the problem can be clearly illustrated by the following situation:

Given a product where the setup cost is $20, the unit manufacturing cost (exclusive of setup) is $10, the annual usage is 1000 units a year, and the inventory carrying charge is 12% per annum. If 1000 pieces were manufactured in a single lot, the direct manufacturing cost would be $10,020 and the inventory carrying charge $5,010 (the average value of the inventory) at 12%, or $601.20, for a total cost of $10,621.20.

If two equal lots were manufactured in six month intervals, assuming a fairly regular demand for the product, the direct manufacturing cost would be $10,040 for the year, but the average value of the inventory would be only $2,510. The first lot of 500 would cost $5020 ($20 setup plus $5000 for 500 units at $10 per unit). With an annual demand of 1000 units per annum, the inventory of 500 units would be reduced to zero in six months but the average value of the inventory is $2510. The same is true for the next six month period so that the average inventory for the year is $2510. The inventory carrying charge is $301.20 (12% of $2510) for a total cost of $10,341.20.

Three May Be Best

Three lots would be even more economical than two. There would be 333 pieces to each lot and the lot cost would be $3350. The average inventory value would be one-half of this or $1675. At 12% the carrying charges would be $201. The total cost would then be $3350 for each of three lots, or $10,050 plus $201 for inventory charges, or $10,251 in total.

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The formula for selecting the optimum lot size under the conditions given above is:

$$Q = \sqrt{\frac{2NS}{I_A C}} \quad *$$

Where:

Q = most economical lot size
N = annual usage
S = setup cost
C = unit cost (exclusive of setup)
I_A = annual interest rate

How is this type of reasoning applied when manufacturing products strictly on contract basis? Consider a contract requiring a quantity **N** of a particular part to be manufactured, whose setup cost is S, unit cost is C, and monthly inventory carrying charge is I_M.

The contract calls for delivery over a period of t months. The total contract cost for this part will be:

$$NC + nS + \frac{N}{2n} \cdot t \cdot I_M \cdot C$$

where **n** is the number of separate lots manufactured.

Expressing this in words, the total cost is the unit cost times the number of parts produced, plus the setup cost times the number of setups required, plus total inventory carrying charge. There are a number of simplifying assumptions that are made here. They are:

1. The in-process manufacturing time is short.
2. The part is consumed at a constant rate.
3. The stock is permitted to go to zero before it is replenished and it is replenished immediately upon reaching zero.
4. There is a uniform lot size.

Under these conditions the minimum economic lot size is:

$$\sqrt{\frac{2N}{I_M t}} \cdot \frac{S}{C}$$

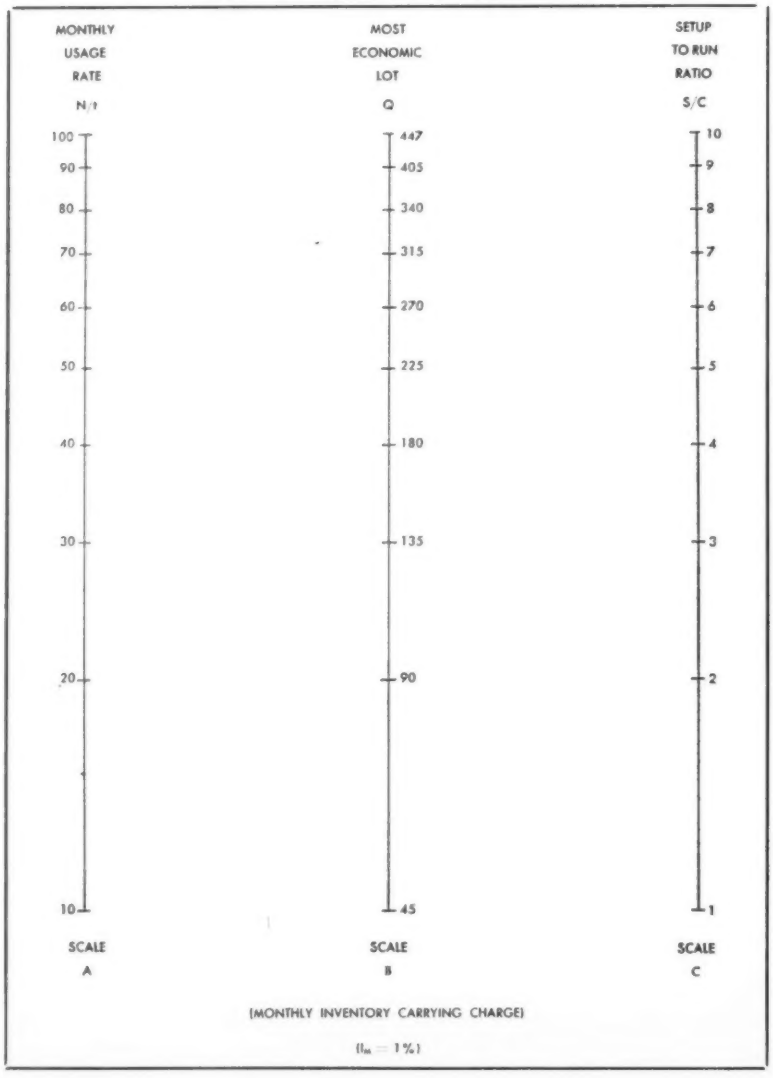
This may strike the factory manager as an awkward and long series of calculations to make to determine economic lot size when manufacturing a complex product with the number of detail parts ranging in the thousands. However, a closer look indicates that there are two important variables in the expression for economic lot size:

$\frac{N}{t}$ = average monthly consumption rate.

$\frac{S}{C}$ = setup to run ratio

Except for especially bulky parts or parts requiring special storage conditions or those particularly susceptible to obsolescence or spoilage, the monthly inventory carrying charge is a constant figure.

Fig. 1. Nomograph for setting lot size.



Easy Way to Set Lots

Figure 1 is a nomograph which shows how to determine minimum economic lot size when the monthly inventory carrying charge is 1%. Scale A is the average monthly consumption rate ranging from 10 to 100. Scale C is the setup to run ratio ranging from 1 to 10. Scale B shows the minimum economic lot size. Dividing this figure into the total number required will give the number of separate lots to run in order to achieve the best balance between setup costs and inventory carrying charges.

Very probably dividing the minimum economic lot size into the total number required will result in a mixed number, i.e. 2.5. Do you run the larger num-

*H. B. Maynard, Industrial Engineering Handbook, McGraw-Hill Book Co., Inc., New York, 1956.

ber of separate lots or the smaller number, i.e. 2 or 3? This can be determined analytically as follows:

Given the condition

$$n_2 > \frac{N}{Q} < n_1$$

where,

n_2 = larger number of lots
n_1 = smaller number of lots
n_1 and n_2 are whole integers
N = total number of parts required for the contract
Q = minimum economic lot
$n_2 - n_1 = 1$

Use n_1 separate lots if

$$\frac{S}{C} > \left(\frac{1}{n_1} - \frac{1}{n_2}\right)\frac{I_M t N}{2}$$

Use n_2 separate lots if

$$\frac{S}{C} < \left(\frac{1}{n_1} - \frac{1}{n_2}\right)\frac{I_M t N}{2}$$

Proof for this is calculated in Figure 2.

Now Pick Setups

Figure 3 is a nomograph which makes it possible to determine quickly the most economical number of setups when the monthly carrying charge is 1%. Scale A is in terms of the lower numbers of lots (n_1). Scale C is the total number of piece-months of inventory ($Nt/2$). Scale B is the value of $(1/n_1 - 1/n_2) \cdot I_M tN/2$, or the most economical number of setups. This is compared to the setup to run ratio. If the setup to run ratio is greater than the value taken from scale B, use the smaller number of different lots; if smaller, use the larger number of different lots. The following problem will illustrate how the nomographs can be used to determine the most economic number of lots to run:

A contract is signed which required 1000 pcs of Part X at the rate of 80 pcs/month. The setup to run ratio for this piece is 6:1.The most economic lot from the nomograph in Figure 1 is 310. The most economic number of setups is either 3 or 4. Using Figure 3, the comparison figure is less than 1; hence, the most economic number of lots is 3. end

Total cost using n_1 lots $= N \cdot C + n_1 S + \frac{N}{2n_1} \cdot t \cdot I_M \cdot C = T_1$

Total cost using n_2 lots $= N \cdot C + n_2 S + \frac{N}{2n_2} \cdot t \cdot I_M \cdot C = T_2$

$$T_2 - T_1 = (n_2 - n_1)S - \left[\frac{N}{n_2} - \frac{N}{n_1}\right]\frac{tI_M CN}{2}$$

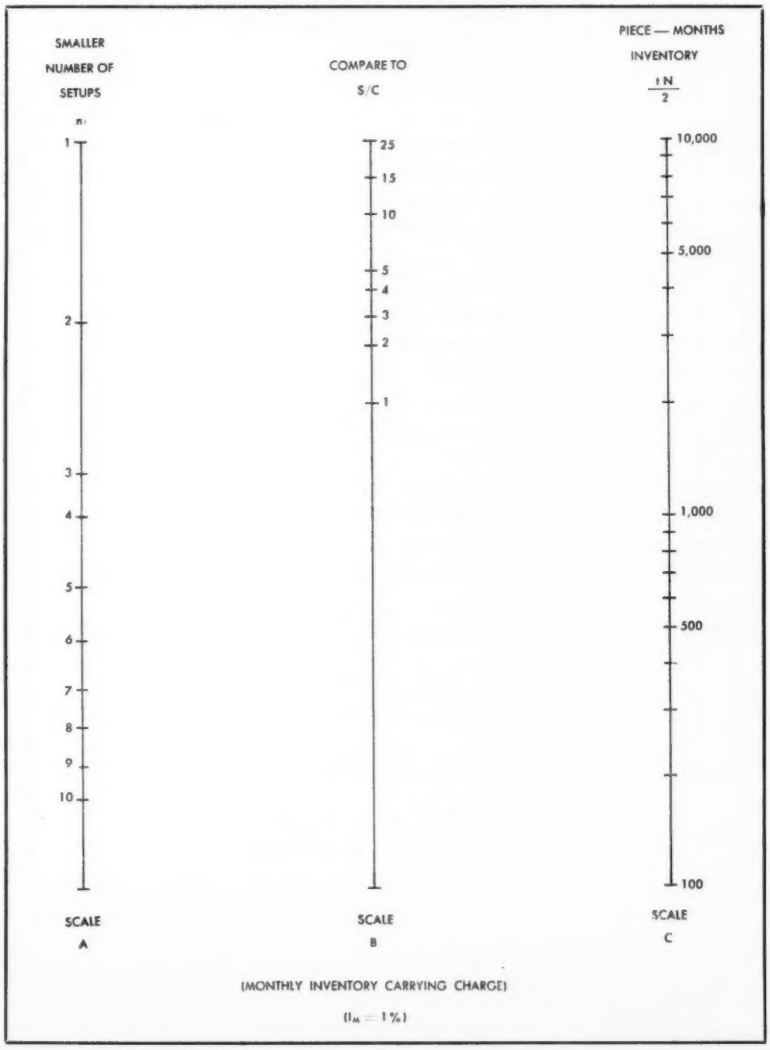
$$= S - \left[\frac{1}{n_1} - \frac{1}{n_2}\right]\frac{tI_M CN}{2}$$

if $\frac{S}{C} > \left(\frac{1}{n_1} - \frac{1}{n_2}\right)\frac{tI_M N}{2}$ $T_2 > T_1$, use n_1 lots.

if $\frac{S}{C} < \left(\frac{1}{n_1} - \frac{1}{n_2}\right)\frac{tI_M N}{2}$ $T_1 > T_2$, use n_2 lots.

Fig. 2. Proof for setup determination.

Fig. 3. Nomograph for figuring setups.



HEAT TREATING TODAY — Fourth of a Series

Surface Treatments

that change the properties of steel

*by Lester F. Spencer**
and
*Charles Weiner***

Processes which change the chemical composition of the surface of steel have many important applications. An increased understanding of these processes and the development of new techniques for their control make surface treatments such as carburizing and carbonitriding good choices for quality results.

ANNEALING, HARDENING, AND TEMPERING are heat treatments which change the internal structure of the steel without affecting its composition; they merely redistribute the elements. Results obtained with these operations are limited by the chemical composition of the steel being treated. In many cases, however, the composition can be changed by heating the steel above the transformation temperature in contact with a medium containing carbon and or nitrogen. The surface layers absorb these elements and, because of the changed composition, the response of the steel to heat treatments is changed.

An obvious advantage of surface treatments is that carbon can be added to a workpiece made of an easy-to-work low carbon grade of steel to give it the properties of a higher grade. When the steel is quenched, the inner core remains relatively soft because its carbon content is low, but the outer surface responds to hardening because of its added carbon content. This "case hardening" is generally used with steels containing less than 0.25% carbon, although higher carbon grades are used in some variations.

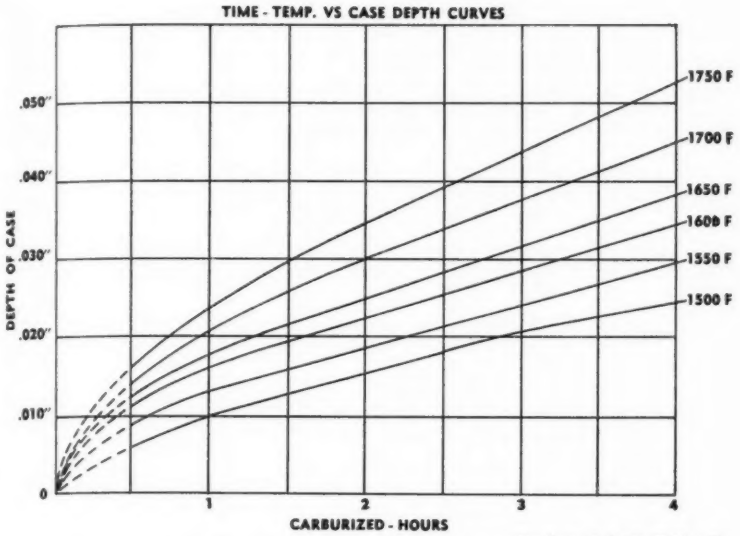
If the part is to undergo subsequent machining after a surface treatment, it is not quenched but is slowly cooled to yield a soft case. It can then be hardened after machining by reheating, quenching, and tempering. When it is desirable to harden only certain sections of a part, coatings or copper plating may be applied to all other sections to prevent absorption of carbon in these areas. Subsequent quenching will only harden the areas which have absorbed added carbon. Selective hardening can also be done by adding carbon to the entire surface and machining off the surface of the sections which are not to be hardened. Quenching then only affects the unmachined areas.

Carburizing

In the carburizing process a low carbon steel is heated to about 1700°F while in contact with either a solid, liquid, or gaseous carbon-containing material. The surface of the steel "picks up" carbon from the surrounding medium. The depth of carbon penetration depends on the medium and the time held at temperature (Fig. 1).

A solid charcoal-rich chemical compound is the medium used in pack carburizing. The parts to be treated are packed into this compound, enclosed in a sealed container, and heated to between 1500° and 1750° F in batch

*Metallurgist, Nuclear & Centrifugal Pump Department, Allis Chalmers Company, Milwaukee, Wis.
**Assistant Editor.



Courtesy of A. F. Holden Co.

Fig. 1. The depth of case that may be expected with a ½" dia SAE 1020 steel bar at times and temperatures shown. For example, after 30 min in the liquid carburizing bath at 1550°F, a case depth of 0.008" will result.

or continuous furnaces. Case depths (depth of carbon penetration measured from the outer surface of the steel) may range from 0.025" to 0.250". After heating for the time required to achieve a specific depth, the parts are cooled in the box, or unpacked, hardened, and tempered.

In liquid carburizing the part is immersed in a bath of cyanide compounds at a temperature between 1550° and 1750°F. Carbon and a lesser amount of nitrogen are supplied by the bath. The case depth produced is affected by the composition of the bath. A "light case" bath is used for case depths up to 0.030". A case depth of up to 0.250" can be produced using a "heavy case" bath. (For this very heavy case a 0.50% carbon steel would be treated for 100 hrs at 1750°F.) Parts are quenched directly from the bath to harden the case.

Gas carburizing is becoming more popular because it produces clean work, is economical, and is easy to control. Parts are heated to 1700°F in an atmosphere furnace, where the carbon is transferred to the steel from the gases in the furnace atmosphere.

Nitriding

Nitriding produces an extremely hard case with excellent wear resistance. It is done in atmosphere furnaces in the presence of ammonia gas. At furnace temperatures between 930° and 1050°F some of the ammonia gas dissociates, yielding nitrogen which forms very hard nitride compounds on the surface of the steel. Special steels containing chromium and aluminum (nitralloys) must be utilized in this process. Nitriding is slow and expensive but good when a hard case and a minimum of distortion are required.

Cyaniding

A thin hard case can be produced by cyaniding. In this process the steel is heated in a molten bath consisting of cyanide compounds. The composition of the bath is such that nitrogen and some carbon is absorbed, to produce a case of 0.002" to 0.005" in depth. After the part is held in the bath for 5 to 10 min (longer for deeper case) between 1350° and 1600°F, it is quenched in water or oil.

Carbonitriding

Carbonitriding is similar to cyaniding in that it adds carbon and nitrogen to the surface of the steel. Ammonia gas and carburizing gases are used in an atmosphere furnace at temperatures between 1200° and 1625°F. Direct quenching in oil provides a hard wear resistant case 0.001" to 0.025" deep. Plain carbon steels can be successfully used in this process.

Skin Recovery

Surface layers of some parts often lose carbon in primary processing. Carbon restoration or skin recovery treatments are used to restore the surface carbon to the desired level.

An atmosphere furnace is used in carbon restoration processes, with endothermic atmosphere (see discussion of "atmospheres," T&P, May '59, p. 40). Close control of the composition of the atmosphere gases by dew point techniques insures that only the proper amount of carbon is added to the steel. When the desired carbon level is reached, the atmosphere protects the surface from any undesirable reactions.

Surface decarburization, on either the plain carbon or low alloy engineering steels, may be the cause of serious failure due to low fatigue properties. Failure starts at the surface, which has a lower carbon content than the core, so carbon must be added to the surface. This is accomplished by carbon restoration treatment.

The skin recovery process is applicable to carbon steels up to and including SAE 1095, and to many of the low alloy engineering steels. Silicon-manganese and nickel steels as well as those containing chromium, molybdenum and/or vanadium (including the NE series) have responded successfully to carbon restoration with the carbon potential control process. Treatment can be done in the same furnace used for annealing, gas carburizing, or isothermal treatments. The "all purpose" batch type furnace (see T&P, Mar. '59, p. 53) was designed for such applications.

An example of the use of skin recovery process is the reclamation of heat treated SAE 4140 bolts which had a decarburized skin about 0.005" deep. By adjusting the atmosphere to provide a carbon potential of 0.40%, the rejected bolts were heat treated with those coming from the production line and passed inspection with a surface hardness of 47 to 59 Rockwell C. By maintaining a carbon potential of 40% during heating for hardening the company eliminated further rejects.

Dew Point Control

A recent encouraging development is the use of dew point measurements to automatically control the carbon potential of the furnace atmosphere. Chemical reactions occur in the furnace gases and release carbon which is absorbed by the steel. Water vapor enters into these reactions, however, and the amount of moisture in the gases affects the amount of carbon released.

By measuring the moisture content or dew point of the gases the carbon potential of the atmosphere can be determined. A particular dew point corresponds to a specific carbon potential. It is possible to change the air-gas ratio, or moisture content, in the furnace, however. The composition of the atmosphere is adjusted until a dew point is reached which corresponds to the desired carbon potential. Then, because only the desired amount of carbon is present in the atmosphere, over- or under-carburization of the steel workpiece is avoided.

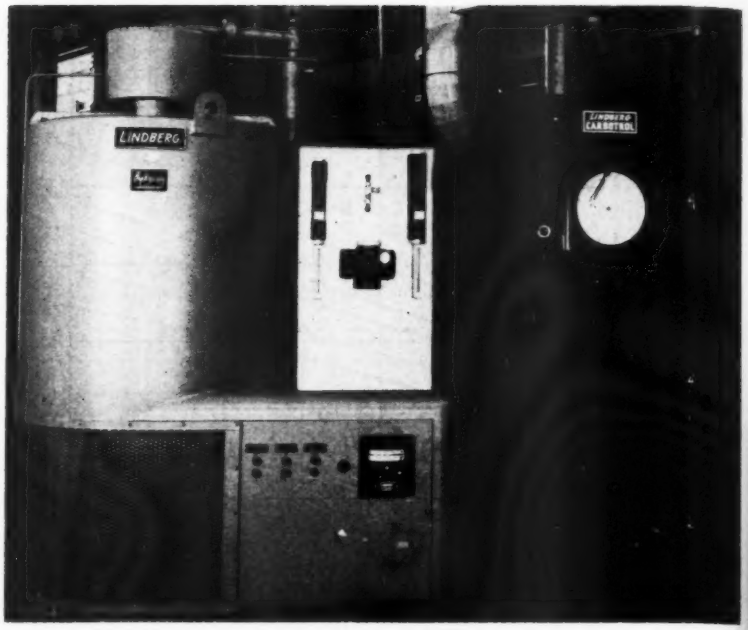


Fig. 2. Endothermic atmosphere generator with automatic carbon potential controller.

Special devices which automatically detect and control the moisture content are used in connection with gas generators (Fig. 2) to control the surface carbon content of steel in hardening, carburizing, carbon restoration, and annealing treatments. The method of operation can be illustrated by using as an example an 0.80% carbon steel (SAE 1080). This material is to be heated to 1600°F in a protective endothermic atmosphere and freedom from decarburization and scale is required.

The proper dew point for these conditions is about 28°F. However, the heat treater need not concern himself with this dew point reading. He merely sets the control indicator at 0.80% carbon potential, and the instrument automatically adjusts the air-gas ratio on the generator to produce an atmosphere that would be in equilibrium with a 0.80% carbon steel. This atmosphere is maintained throughout the heating cycle.

How is this done? A typical dew point instrumentation consists of three basic units: (a) a water vapor sensing unit in the furnace; (b) the recording and controlling unit, mounted in a control panel; and (c) a proportioning control valve mounted on the generator or the furnace in such a manner that the rate of the air-gas ratio change may be turned into a chemical reaction rate in cracking of the fuel gas.

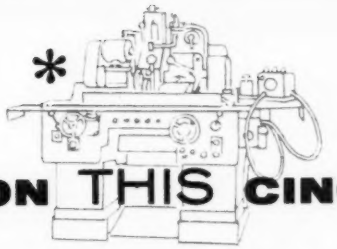
There are a number of methods for measuring dew point, the majority of them for furnace atmosphere or generator gas. The equipment ranges from simple, inexpensive, hand-operated dew point cups to fully automatic and relatively expensive controlling systems. end

PROPERTIES OF SURFACE TREATED STEELS FOR GEARS

Severity of Service	Treatment and Steel	Case Depth (inches)	Hardness Rc	
			Case	Core
Very heavy duty	Carburized, low-carbon	over 0.060	58 minimum	up to 45
Heavy duty	Carburized, low-carbon	0.040-0.060	58 minimum	up to 45
Medium duty	Carburized, low-carbon	0.020-0.040	58 minimum	up to 45
Medium duty	Carburized, 0.30% carbon	0.010-0.015	58 minimum	35-50
Medium duty	Carburized, 0.40-0.50% carbon	0.005-0.010	50-60	45-55
Medium duty	Cyanided, 0.40-0.50% carbon	0.003-0.010	58 minimum	45-55

Courtesy Dr. E. B. Evans, Case Institute of Technology.

CINCINNATI



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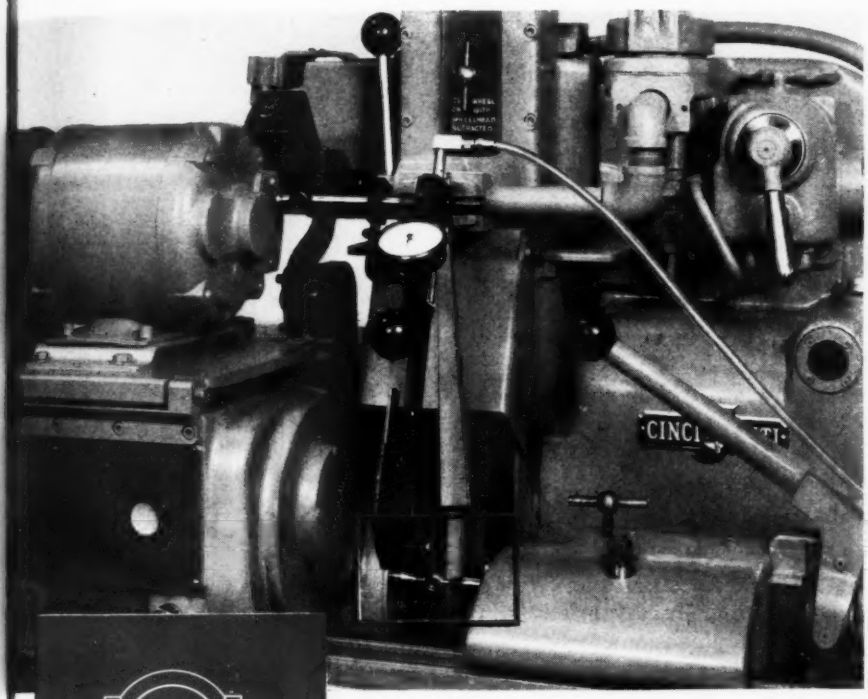

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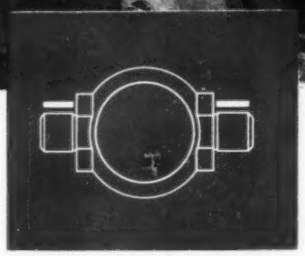
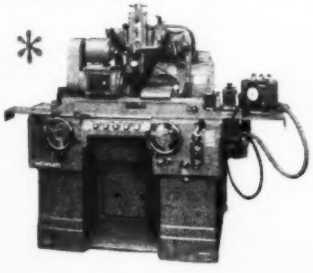


DRAWING OF SPIDER being ground in illustration above; heavy lines indicate ground diameters. Production, 50 per hour at 80% efficiency.

Below: **CINCINNATI FILMATIC 4" PLAIN HYDRAULIC GRINDER,** specially built and equipped to grind small parts at a low-cost production rate, and to master gage accuracies. Complete data in catalog No. G-551-5.



Accuracy begets accuracy. Cincinnati equipped this 4" Plain Grinder, a fine machine in its standard attire, to obtain an amazing degree of repetitive accuracy on production work . . . *sizing and roundness are within millionths.*

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The exactness required in today's space aeronautics parts and other types of gages and equipment cannot be provided by conventional grinding machines, especially those over five years old. It takes a new CINCINNATI, with Cincinnati's long-time experience in creating accuracy that begets accuracy. The 4" Plain Grinder illustrated here demonstrates just a few of many reasons why it pays to specify Cincinnati. We'll be glad to tell you more. **Grinding Machine Division, The Cincinnati Milling Machine Co., Cincinnati 9, Ohio.**

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Draw-Bend and Braze

Stainless Missile Tube Assemblies

*by H. M. Jenkins**

FLUID SUPPLY LINES IN MISSILE ASSEMBLIES and sub-assemblies are a maze of formed tubing. The complexity of the bends involved and the limited space of their installation give missile jobs the appearance of a "plumber's nightmare."

Stainless steel tubing is usually specified to meet critical missile specifications. Accurate bending of this tubing to close dimensional tolerances, and joining it to related system components by other than mechanical means, presents problems that have been successfully solved by draw bending and brazing.

Draw type bending, when properly performed, can consistently produce configurations accurate to within 0.001"/in. of bend length for each bend in the line. Brazing the tubing in a controlled atmosphere furnace then consistently produces joints that are strong, leakproof, bright, and clean.

Compression and press bending are alternative tube forming methods, and use of threaded fittings and welding are alternative joining methods for missile tubing. Small bend-to-OD ratios, high operating efficiencies and peak strength, so necessary in missile tubular designs, however, generally preclude selection of compression or press bending. Joint strength, appearance, dimensional accuracy, and leakproof characteristics are factors which generally favor brazing over mechanical or welded joints at the tube ends.

Draw Bending

In draw bending, tooling consists of a clamp die, a rotating form die, a pressure die and sometimes a wiper die. The clamp die clamps the tube to be bent tightly to the form die which is rotated by a vertical shaft in the bending machine.

The tube is drawn into the pressure die by the rotating form die. Friction between the pressure die and the tube is held to a minimum by allowing the pressure die to move longitudinally in the same direction as the tube. Positive pressure holds the tube firmly between form and pressure dies, drawing it into the radius developed in the contour of the form die.

Actual bending takes place at a single point of contact, where the tube is pressed against the pressure die. This simplifies control of tube cross-section shape during bending. A ball mandrel inserted at this contact point prevents tube collapse and substantially reduces the flattening effect, which in draw bending is always severe.

In draw bending, roughly two-thirds of the cross-section of the tube is in tension. Thus the flattening effect is more severe than in compression bending. In compression bending, two-thirds of the tube cross-section is in compression. This contributes to buckling or wrinkling of the in-

*Plant Manager, Walleo Manufacturing Division, Wall Colmonoy Corporation, Detroit, Mich.

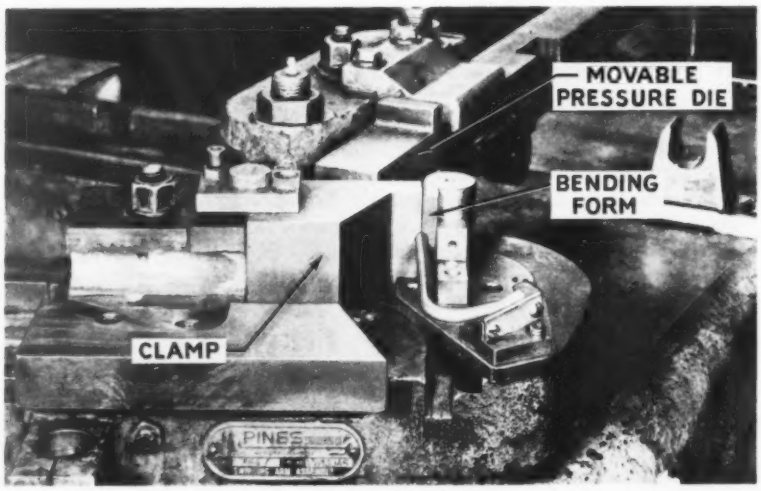

Fig. 1. Hydraulic-powered draw bender produces close tolerance bends in stainless steel tubing. The rotating bending form draws the tube into the movable pressure die.

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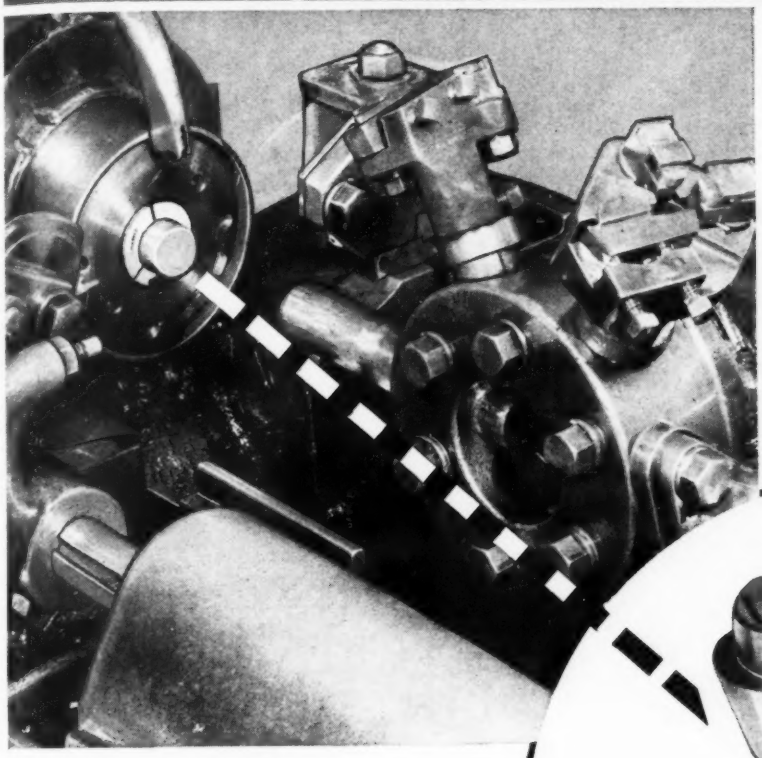

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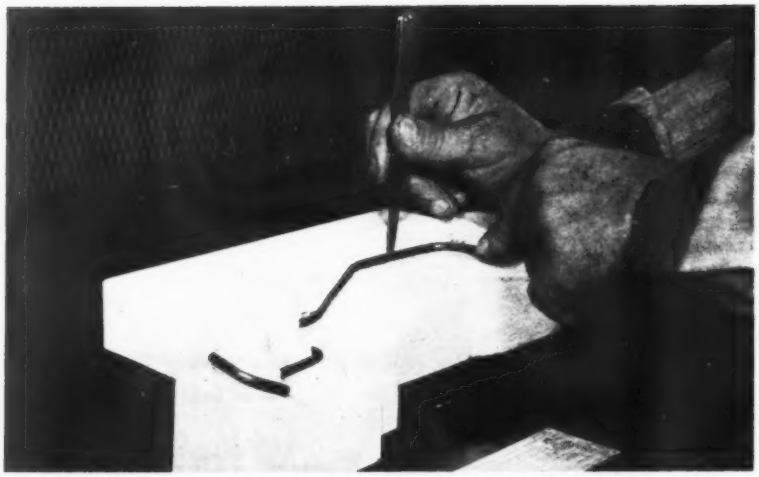

Fig. 2. Inexpensive, yet accurate plastic gage checks bend accuracy. It is quickly produced and easily repaired or reworked.

side of the bend, which becomes more severe as the radius becomes smaller and tube walls become thinner.

Although the flattening effect of draw bending can be controlled easily with an internal mandrel, the wrinkling effect of compression bending can be effectively controlled only by limiting wall thickness and bend radii. Compression bending is chiefly limited to high-speed production where the wall thickness of the tube and the bending radii are relatively large. For thin-walled tubing or small-radius work, draw bending with the aid of an internal mandrel is preferred. With suitable draw bending machinery and adequate processing skill, bend radii as small as the tube OD (a bend-to-OD ratio of 1:1) can be produced. Ductility of the material determines how much one may decrease the neutral axis radius.

Effect of Springback

In all types of bending a certain amount of springback occurs because of relaxation of stresses in metal sections which have been stretched to less than their elastic limit.

Radius influences springback; the smaller the radius, generally, the greater the springback in a given material. Countering the

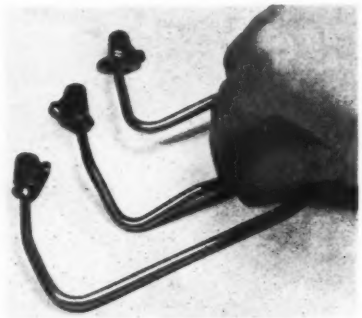

Fig. 3. Brazed on mechanical fitting eliminates a potential leakage source in missile lines.

radius effect, however, is the factor of "mass in tension," which resists the tendency to spring back. The mass of relatively undeformed metal also influences springback effect. The greater the mass, the greater will be the tendency to spring back.

Radius, mass in tension, and mass of relatively undeformed metal work in every bend to determine net springback effect. With the latter two of these factors favoring draw bending over compression bending, springback will generally be less in a draw bend.

Springback can be anticipated and is controlled by over-bending. The springback effect brings the tube back to the desired dimension. The greater the springback, however, the greater will be the difficulty in holding tolerances. Hence, draw bending produces greater accuracy than compression bending, all other things being equal.

Press bending produces a relatively large amount of springback and is not recommended where bending accuracy is a major consideration.

Joining Methods

In missile systems, mechanical joints for connecting formed tubing have two limitations: they must be accessible for installation, and they must not leak under the operating pressures and temperatures imposed.

Mechanical connections require a wrench or tool of some type for installation. Because of space limitations in the missile system, use of mechanical joints is often impossible.

The obvious solution is to make every joint a permanent connection. This too is impractical because of the possible need to break the tubing at several points within the system for removal and replacement of subassemblies. Therefore, at least one and possibly several mechanical joints must be considered.

Possibility of leakage is the most critical limitation of a mechanical joint in a missile system. The flared compression joint most frequently used is generally recommended for working pressures up to 500 psi where safety is essential. Test pressures of up to 6000 psi are used in sub-assembly pre-flight checkouts. Such pressures can cause the mechanical joint to leak, not so much between the male and female threaded fittings that form the joint, but between the fittings and the tube.

Fittings must be at just the right attitude when assembled to avoid leakage conditions, even where moderate working pressures are involved. In a missile system, therefore, the design engineer should avoid use of mechanical joints wherever possible.

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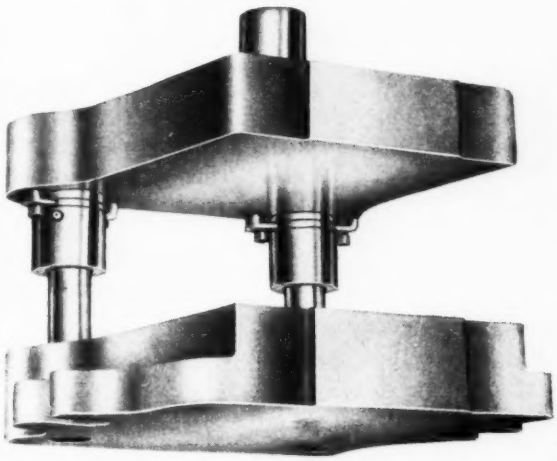

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Where a mechanical joint must be used, O-rings or other seals can sometimes be used effectively to minimize leakage. Use of special seals is limited, however, to low and medium-temperature applications. Elevated temperature conditions can result in deterioration of the seal material, causing leakage.

The best compromise solution for the tubing joint where a mechanical connection must be used is a combination of brazing and mechanical fittings. In this technique, the fitting is brazed to the tube in the precise attitude desired for final assembly. This minimizes leakage potential and eliminates one mechanical joint between tube and fitting.

Welding Not So Versatile

Inert gas-arc and electric arc welding are other possible methods for connecting missile system tubing; neither are as versatile as brazing, though. Inert gas-arc welding is expensive and suffers from poor dimensional repeatability where production requirements are low. When used with automatic equipment the process is useful, but in missile systems production it is impractical, and hence generally not recommended for joining missile tubing.

Electric arc welding is not practical where leakproof joints are required because of the tendency toward porous deposits. Because it is a hand-welding process, uneven fillets result, causing stress risers at the joint.

Selecting the Brazing Alloy

Stainless steels or super-alloys are most frequently specified for missile work to meet corrosion and heat requirements. Their own special assembly requirement is a suitable brazing alloy.

High nickel-base stainless type brazing alloys that produce joints possessing every characteristic desired for a missile system are readily available. Specifically intended for use with stainless steel components, they feature high strength and have excellent heat and corrosion resistance. Their coefficients of thermal expansion are equivalent to those of stainless steels. A variety of compositions are available for a wide range of specific conditions.

The nickel-base alloys are most frequently used as a fine powder, but are also available as oxy-acetylene rod, plastic - bonded sheet, plastic-bonded wire, prefabricated rings, or flux-powder paste.

The requirements of corrosion and oxidation resistance automatically eliminate copper brazing as a possibility, even though in other respects it may meet missile type specifications.

Silver is frequently specified for brazing missile tubing assemblies. Its strength at moderate to high temperatures, oxidation resistance, and in certain cases, corrosion resistance, limits the use of this material. Silver brazing alloy should be used only where moderate temperatures (600° - 1000° F, depending on time at heat) are involved and where joint strength is not critical.

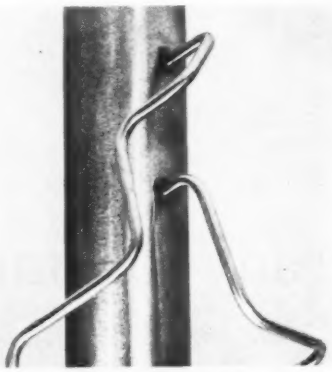


Fig. 4. Stainless steel missile component ready for brazing with nickel-base type alloy.

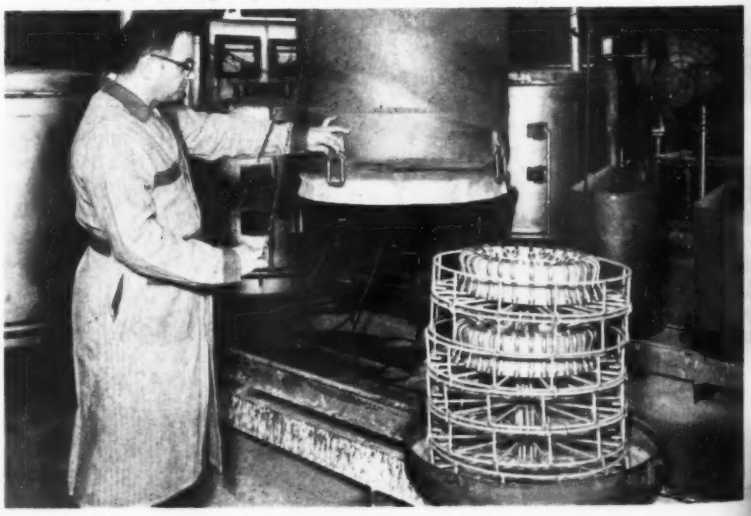
Brazing Operation

Brazing is usually performed in a controlled atmosphere furnace using pure dry hydrogen. Tubing assemblies are processed one to a retort (unless the assembly is very small) to insure positive control of brazing conditions and to obtain maximum uniformity of braze in all joints.

With proper processing, using a nickel-base brazing alloy, formed tube dimensions generally will be held to within 1% of dimensions before brazing. Brazed parts will come out bright and clean, requiring no secondary operations. Joints will be strong and fillets uniform.

Production procedures must include critical inspection following brazing. Master checking fixtures, air or fluid pressure rests, mass spectrometer checks, and other types of inspection operations are strongly recommended to insure high quality in the brazed components. end

Fig. 5. Formed stainless steel tubes and threaded mechanical fittings ready for brazing in pure dry hydrogen furnace.



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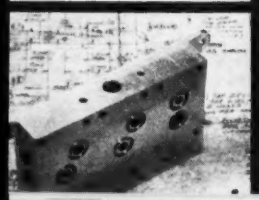

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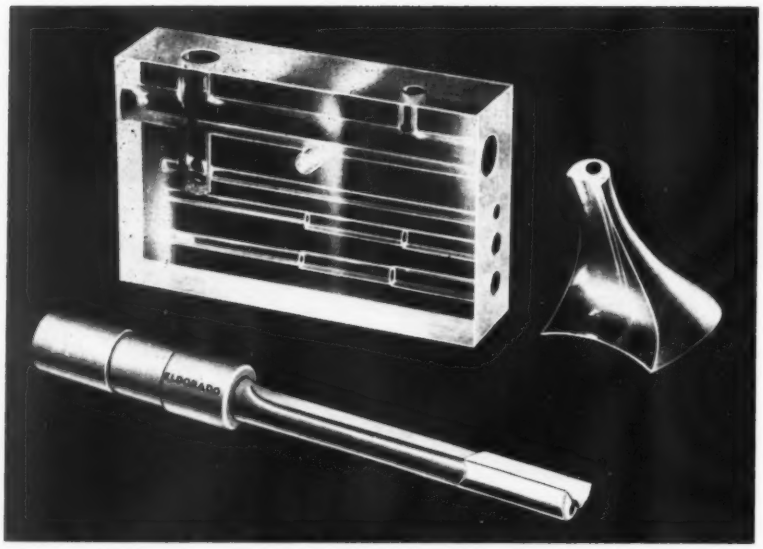

Fig. 1. Typical Eldorado gun-drill and two tests showing efficient plastic drilling. At the left: examples of cross-holes and three-step drilling of holes of several sizes. At the right: hole drilled to exact specifications in lucite heel of women's shoes. These gun-drilling jobs were accomplished quickly and at far less cost than with other drilling techniques. Further, there was not the scoring or gumming frequently encountered when drilling plastics.

Tests Show How You Can

Apply Gun-Drilling to Plastics

*by Frederick S. Bloch**

DRILLING HOLES IN PLASTICS is, in itself, not difficult. But when tolerance, smoothness of surface finish, and complex drilling requirements are involved, the situation more often than not takes on a different view. In many instances, the full potential of plastics is not fully utilized because most drilling techniques fail to solve key problems and only serve to contribute to higher production costs.

We, as a manufacturer and designer of gun-drills and gun-bore tools have conducted a wide range of preliminary tests. Using a number of plastics, tests indicate that considerably lower costs may be gained by gun-drilling plastics rather than drilling with previously used methods.

*President, Eldorado Tool & Manufacturing Corporation, Milford, Connecticut.

In these tests at Eldorado, our engineers have successfully drilled parts to exact hole sizes in acetates, acrylics, phenolics, lucites and other moulded forms, producing a finished hole in a single operation. This has been done at speeds considered phenomenal by normal plastics production standards.

Hole Sizes Held to 0.0005″

For example, a three-step hole, Figure 1, was drilled in a piece of acrylic. The hole's diameters were 3/8″, 1/4″, and 3/16″ with a tangent point at the outside circumference. Not only was the speed of the operation faster than that of any previously used method, but surface finish was equivalent to 15 rms and accuracy of the hole diameter was held to 0.0005″. Gun-drilling apparently eliminated such difficulties as gumming, melting, and scoring or marring finish, all or some of which were encountered when other drilling techniques were used on plastics. These obstacles did not appear even though we were conducting our tests on converted equipment.

Basic Gun-Drill Design

The "secret" behind the effectiveness of a gun-drill lies in the basic design of the drill. The gun-drill, Figure 2, is basically a drill tip with a single cutting edge and a special relief that assures a round, straight hole during the drilling operation. The tip, usually of tungsten carbide for extra hardness, is brazed on a fluted shank designed to permit the injection of cutting fluid. The fluid reduces friction at the drill tip and allows flushing out of chips. The combination of the

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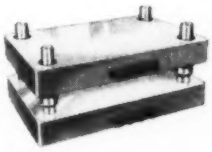

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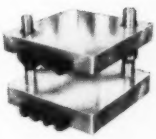

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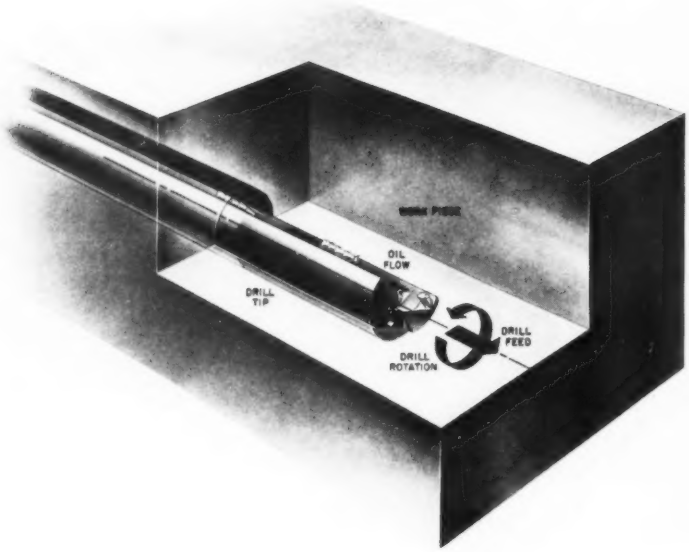


Fig. 2. Phantom view of gun-drill operation showing pattern of cutting and chip removal. As drill rotates, oil flow picks up loose chips and carries them back through the flute. Clogging of workpiece with chips, particularly at the cutting end, is thus prevented, making possible the high speeds and feeds of gun-drilling.

drill's design and the materials used in its construction make for long life and the ability to drill at notably high speeds. A gun-drill can have a feed rate as high as 30 ipm in production, depending upon the machine, the drill setup, and upon the material being drilled. In conducting their tests on plastics, our engineers drilled at a rate of 25 ipm which they determined as maximum for the test setup.

Machines:
Specials or Conversions?

As with all machine setups and operations, gun-drilling requires that certain basic conditions be met if maximum efficiency, accuracy and speed are to be obtained. Purchases of special gun-drill machinery or conversion of machinery on hand is an option which should be discussed with a gun-drill specialist. In many cases, existing lathes or power-feed drill presses may be converted to gun-drilling operations.

There are certain basic requirements for all gun-drill machinery, special or converted. These requirements are:

1. The machine must be rigid with a minimum of vibration.

2. The spindle must be capable of high drilling speeds and must have enough power to drive the drill without being slowed down because of slippage or motor overload.

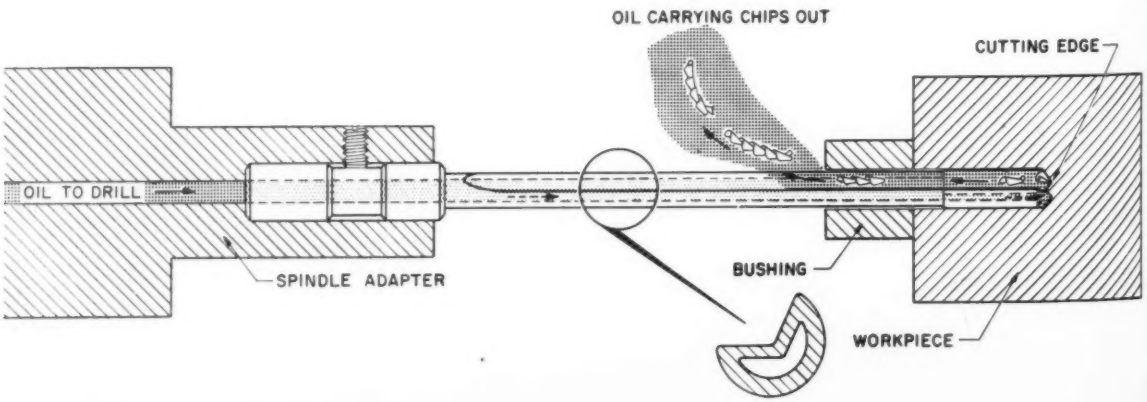
3. The setup must include a bushing arrangement through which the drill can pass for a good start. The bushing acts as a pilot hole and should be in contact with the work. Its ID should be no more than 0.0002" larger than the drill.

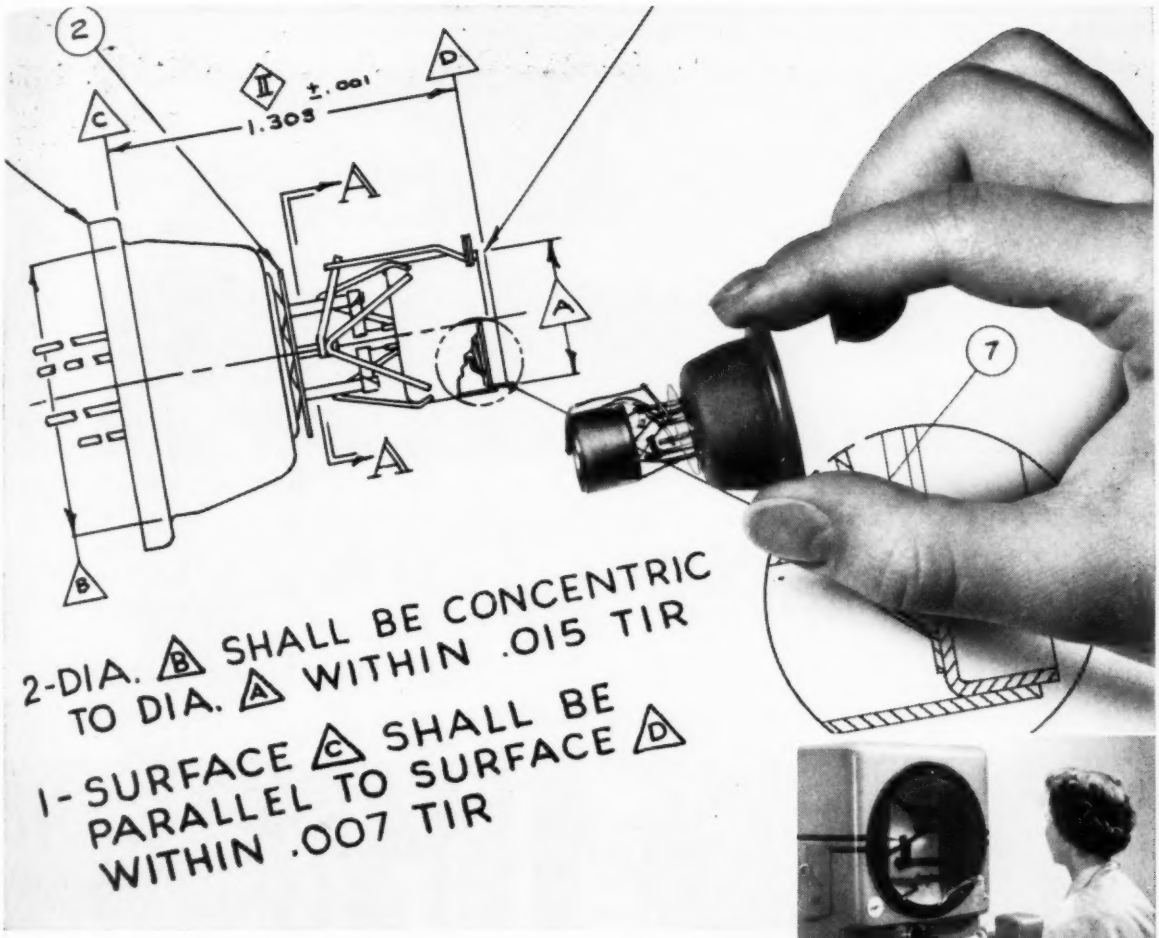
4. Feed mechanisms must be positive and adjustable so as to obtain the best feed per job. Variations in feed per revolution affect tool life and accuracy of drilling.

5. A proper coolant system must be provided so that the drill can operate with maximum efficiency and minimum drill tip wear. The coolant, which should be an oil, should have a low viscosity for easy flow under operating conditions and high lubricity. It should be injected into the sys-

... Continued on page 72

Fig. 3. Detailed schematic of oil flow pattern. Oil must be fed with sufficient pressure to carry it the length of the drill to the tip. Gun-drill chips are usually fine, permitting rapid flow of oil out of the workpiece. An efficient drain and filter system providing fast separation of chips allows the oil to serve as both coolant and chip conveyor.





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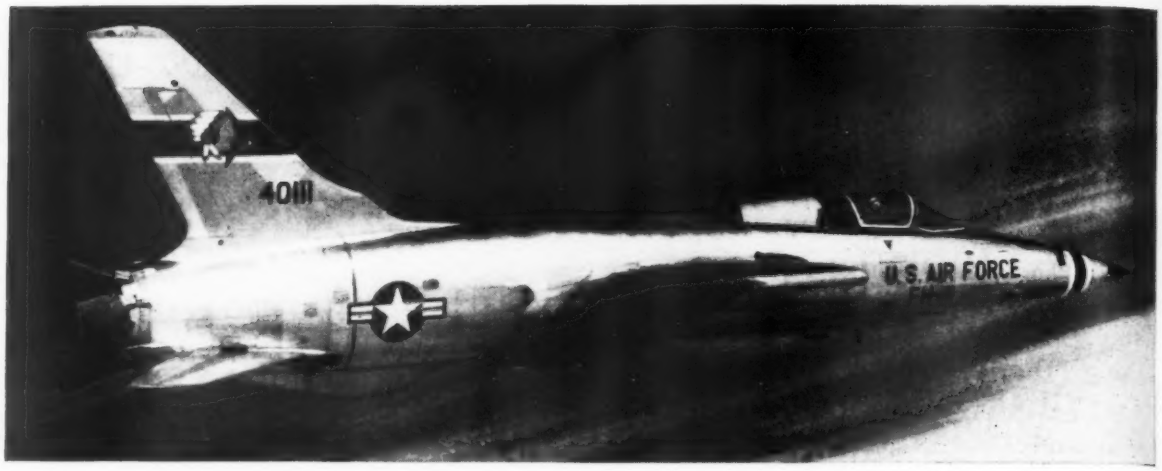

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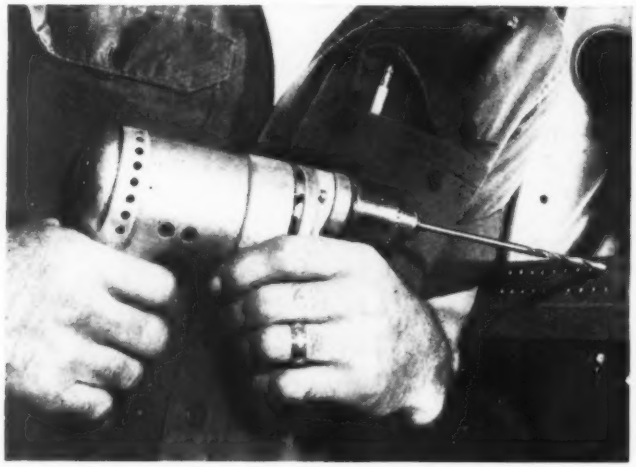

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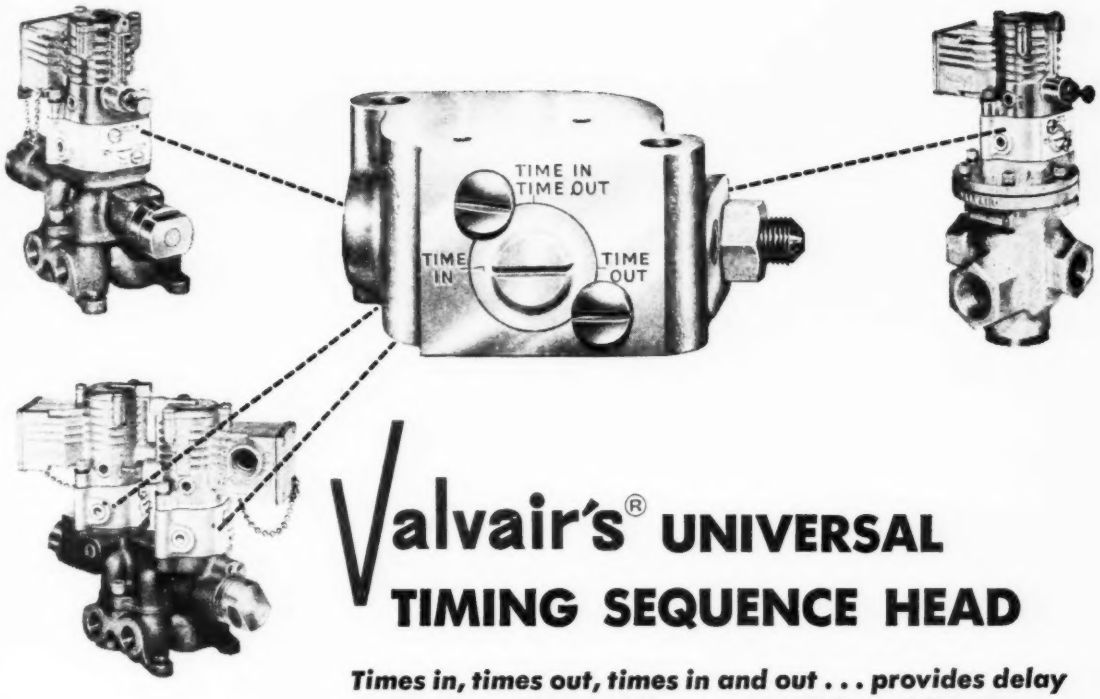

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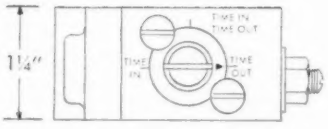

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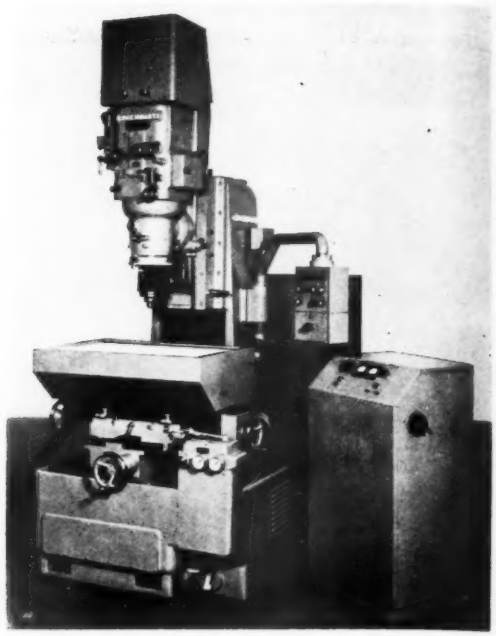

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33 New Electrospark Machining Combinations

A COMPLETE NEW LINE of 33 electrical discharge (electrospark) machine tools, built from 16 basic units, makes its debut this month at Cincinnati Milling Machine Company. The building block type Elektrojet line was designed from the floor up for the specialized requirements of machining by electric sparks.

It consists of a single base and column on which may be mounted four interchangeable workheads — non-rotating, rotating, universal, and ram-type — and four different base tank units. Fixed and adjustable workhead slides are also offered, and a

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. . . **Gun Drilling from page 68**

tem with sufficient pressure and volume.

6. An efficient chip removal system and good drainage are necessary to keep the drill in continuous operation. If the oil coolant, Figure 3, is supplied with proper pressure and volume, the chips will flow back easily in the drill flute to the chip pan. An efficient system provides for removal of chips and filtering of coolant and its return to the system.

Coolant-Lubricant

Oil coolant is an important part of gun-drilling in plastics. It reduces friction at the drill tip, flushes away chips, and keeps material temperatures at harmless levels. Proper coolant is a prime reason for the elimination of gumming. Coolant also helps to keep hole finish smooth and clear, making possible the drilling of holes at high rates of feed.

Our tests produced feed rates of 0.002 ipr with drills of 0.1250″ and 0.1875″ diameters, and feed rates of 0.005 ipr with drills of $\frac{3}{8}$″ and $\frac{1}{2}$″ diameters.

In one simulated production test, Figure 1, a hole of 0.210″ dia was drilled in a plastic (lucite) heel for ladies' shoes. Drill speed was 8300 rpm with 0.003″ fpr. The result was a 25 ipm penetration. Chips were small and tool life was judged unlimited. Actually, the drill could have been run at a speed of more than 10,000 rpm with a machine of sufficient capacity.

Similar tests with Phenolic (grade CEE) also produced impressive results. A drill of 0.1875″ dia placed two holes in a single piece to an accuracy within 0.005″ alignment of holes in 6″ depth. Speed was 8300 rpm and was limited only by capacity of machine and setup. With equipment of sufficient capacity, we estimate the material could have been drilled at a speed as high as 800 sfm (16,000 rpm).

Eldorado's extensive tests, while admittedly still preliminary in nature, confirmed our beliefs that gun-drilling may be the answer to many drilling problems now limiting the use of certain plastics. Surface and hole finish, tolerances, and speed of production, can all be achieved to meet and often surpass requirements. Production costs are in line with those reported for gun-drilling other materials and are far less than those reported as being typical of drilling plastics by other methods. With gun-drilling, there is apparently no limit to the type of jobs that can be accomplished in plastics. end

choice of 20-, 40-, 60-, and 100-amp power supplies. The machine illustrated above and on the cover has a standard base and column, and movable tank and universal workhead. The line is rounded out by two electrical discharge grinding machines and a heavy duty electrospark die sinking machine for working blocks to 18″ thick.

In principle, high-energy sparks jump between an electrode and the workpiece under controlled conditions. The sparks erode away the workpiece and thereby duplicate the shape of the electrode.

The electrode never actually touches the workpiece, but 10,000 to 250,000 times a second, sparks flash from it to the workpiece across a gap of about 0.001″. Both workpiece and electrode are bathed in a dielectric fluid to quickly quench the sparks and wash away the debris.

The new machines use a pulse-type circuit, which is more complicated but much faster than the resistance and capacitance type. Cavities of 50 cu in can be machined with them at metal removal rates of as much as 0.016 to 0.018 cu in/min.

These new machines can produce bottom corner radii as small as 0.002″, and bottom corner radii of 0.008″ at regular production speeds are routine. Experimentally a hole 0.00003″ out of round had been produced on one of them. Large die cavities are being sunk with the Elektrojet machines with dimensional accuracies of ±0.005″ from the desired form. On smaller applications, ±0.001″ accuracy is typical.

For detailed literature, contact Cincinnati Milling Machine Co., or circle 731 on the Inform-A-Gram card.

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Special note to buyers of capital equipment

Speed-Band's greater potential of standard equipment can eliminate the need for expensive special machinery.

Speed-Band's increased performance potential allows standard carbon bandsaw machines to be operated to their full capability for the first time.

Speed-Band's flexibility permits its use on machines designed for high speed bands, and where applicable, can reduce tool cost substantially.

Before you buy, see your Capewell Distributor for all the details on Speed-Band, the sensible band saw.

SER

CADEWELL

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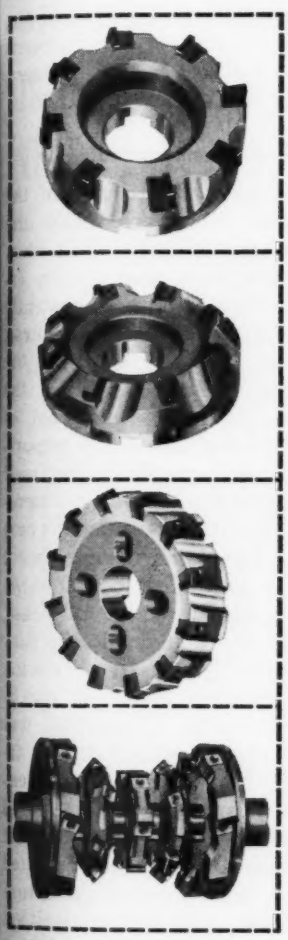
More Milling Possible... Milling More Profitable with FUTURMILL

and a handful of carbide blades



Futurmill's indexable milling cutters converted so many *slow and expensive* machining methods to *fast, low cost* operations, that they established the value of "indexable tooling" . . . recognized as one of today's most important contributions to metalworking progress.

1. Lower cost metal removal

Futurmill takes the burden out of milling with inexpensive indexable carbide blades. No need to remove the cutter from the machine . . . no more cutter grinding and no more delays and lost production time. Index a Futurmill quickly and accurately, right on the machine. Eight times per blade with negative rake cutters and four times with positive. Futurmill's precision ground blades get the finest finish obtainable and more metal removed per cutting edge.

2. Plenty of muscle for any job

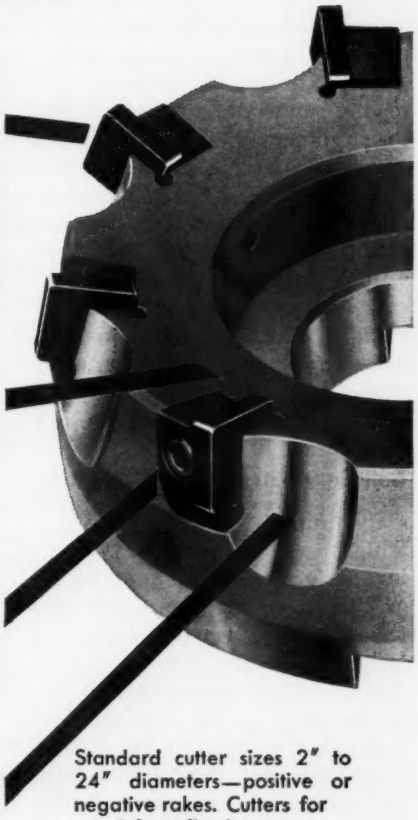
The cutter body is a solid one piece construction of heat treated alloy steel . . . not only the most rigid cutter built . . . but precision built.

3. Protection for the cutter body

The case hardened wedges behind the blades absorb the damage in case of an accident and save the cutter body . . . cutting down expense and lost production time for cutter repair or replacement . . . reducing inventory investment. With just a few extra wedges you're back in production.

4. Unobstructed chip clearance

Huge chip pockets in front of the blades direct the chips ***out and away*** from the cut—critical on steel applications and on deep cuts.



Standard cutter sizes 2" to 24" diameters—positive or negative rakes. Cutters for special applications.

FUTURMILL, INC.

6360 Highland Road • Pontiac, Michigan

CIRCLE INFORM-A-GRAM KEY NO. 75

The Engineer in Patent Suits

*by Robert L. Spencer**

THE DEFENSE TEAM IN SUITS for patent infringement usually includes a trial attorney who is in charge of the case, an engineer who is the technical expert, and the corporation or house patent attorney, if there is one. In addition, there may be a so-called "patent expert."

Preparing for a trial is essentially an investigative and educational procedure wherein the attorneys, engineers, and experts become familiar with the patent in suit and the accused structure and develop and become familiar with the defense material. The objective is to develop the best defenses and present them simply and directly so that a technically untrained person can readily understand and follow the argument of the trial attorney without undue effort. To achieve this result may require, in a complicated case, close screening of possible defenses with elimination of some for the sake of simplicity and understanding. This screening process necessitates careful analysis and study by both the engineers and attorneys.

Collect, Analyze Facts

By filing a suit for patent infringement, the patentee is saying, in effect, "You have used my invention—pay me." One of the most effective ways to counteract this charge is to show the Court that the accused device, or others like it, or the patented device was developed by the defendant before the plaintiff filed his application for his patent. Such a defense obviates any claim of "getting something for nothing" from the patentee. In addition, where it can be shown that the accused device was developed independently of the patentee, the distinctions between the patented and accused devices may be pointed out more effectually, and the defense is more readily accepted. To establish such a defense requires a thorough investigation of prior developments by the defendant, including not only the accused structure itself but any additional developments of like nature which may or may not prove to be helpful. Obviously this investigative phase is lengthy and difficult and requires expert technical assistance which can only be rendered by the engineers acquainted with the subject matter. In the course of the investigation, thousands of documents, such as drawings, purchase orders, and test reports, may have to be examined. It is only through close cooperation with the engineers that a clear picture of various pertinent developments can be obtained.

When the defense material has been collected, analyzed, and what is to be used has been determined, the problem is to present the defenses in such a clear and concise manner that they can be readily understood in a minimum of court time. This is usually accomplished through the use of large charts illustrating the patent in suit, the accused device, and the defense material. Here again, the technical assistance of the engineer is required in order to insure accuracy of representation so that the charts may not be attacked for failure to truly illustrate the device they represent.

Most patent infringement suits are tried by a Judge without a jury, but in a few there is a jury in addition to the Judge. In either case, it must be remembered that neither the Judge nor jury will be familiar with the subject matter, and the chances are that neither will be technically trained. Therefore, the manner in which the defenses are presented may spell the difference between success and failure, and, consequently, it is important not only that they be presented in a technically accurate fashion but also that they be presented as simply and clearly as possible. The charts are the tools by which the trial attorney is able to present his case in a minimum of time and with clarity. To prepare them so that they tell their story simply, clearly, and accurately presents a real challenge to the engineers, as well as the lawyers.

Charts Aid Understanding

Throughout the course of the trial the charts are before the Judge and the jury, and, when well done, they may be very effective. Charts do not constitute evidence, and evidence, of course, must be presented. However, the evidence as illustrated by the charts receive a great deal of attention and may create important impressions. This was well illustrated in a recent suit wherein the plaintiff presented his case by the use of charts which were obscure and hard to follow. At the conclusion of plaintiff's case, neither the Judge nor the jury understood the patented device, the accused structure, or the issues involved. The jury was clearly bored and mentally fatigued. Fortunately, the defendant's charts had been colored and otherwise prepared so that the various parts of the patented device and accused structure could be seen and understood easily. The jury learned about the case from the defendant rather than the plaintiff. After three weeks of trial time the jury required 20 min to return a verdict for the defendant. It was largely a result of the careful

*Patent Section, Central Office Staff, General Motors Corporation, Detroit, Michigan.

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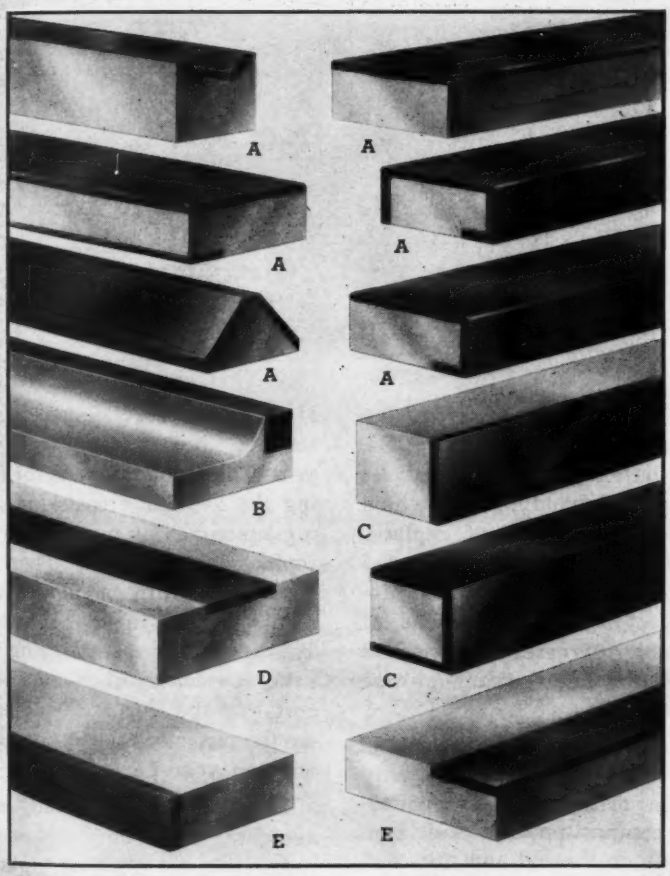
NEW READY MADE STANDARD HARDENED SHAPES SAVING MONEY FOR HUNDREDS OF COMPANIES

USED FOR DIES, DIE SECTIONS, FLANGE SECTIONS, WAYS, GIBS, RAILS, WEAR PLATES. CARRIED IN STOCK BY OHIO KNIFE CO., CINTI., OHIO.



A—Hardened Ways and Slides B—Composite Die Sections
C—Heel Block D—Center Clad E—Flange Slide

Over 12 standard cross sections in over 80 sizes now available.

The multiple use of these sections by machine tool builders, die makers, etc., has increased tremendously. Great savings are achieved by being able to order from stock and in lengths up to 120". They are delivered to the customer with cutting, forming or wear surface already machined, hardened and ground. The soft steel backing, to which specially hardened tool steel is clad, can be drilled quickly for dowel and screw holes. The special O-Kni-Co hardening process (65-66) Rockwell to the full depth of tool steel along the entire length of the section develops tremendous wear resistance. They are precision made to the closest tolerances. Also available are clad aluminum bronze wear plates (¼" thick aluminum bronze clad to a tough, easily machinable steel base.)

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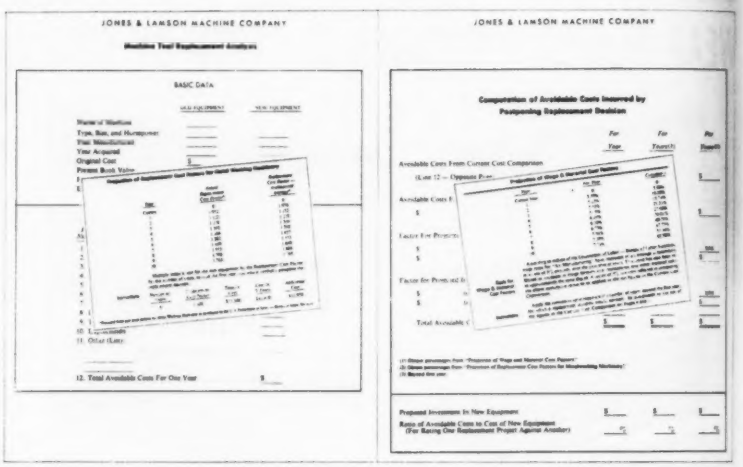
and extensive preparation and assistance on the part of the engineers connected with the defense of this suit that the defendant's case was presented clearly, understood, and accepted by the jury.

In summary, the role of the engineer in a suit for patent infringement is an important one. It includes assisting the attorney in finding the evidence, studying and analyzing the patent in suit and its relation to the accused structure, giving technical advice to the attorney throughout the development of the defenses, rendering technical assistance in preparation of charts and other exhibits used in the court room, and testifying at the trial. Engineers are busy people who have pressing problems which at any given moment may appear more important than "digging up their past mistakes." Becoming involved in a suit for patent infringement may be looked upon initially as an unnecessary or at least an unwelcome burden by the engineer. However, as the defense picture is pieced together and the preparation for trial is completed, the engineer who contributes his time and efforts may well be proud of an important job well done. The giving of testimony during the trial is an interesting and unusual experience for most engineers. At the conclusion of a successful defense, a verdict for the defendant frequently is as much a source of satisfaction to the engineers involved as it is to the attorneys, for without the engineers' capable assistance, success could not be achieved.

Inflation Considered in New Replacement Form

We're living with inflation, so why overlook it when analyzing machine replacement comparisons? Jones & Lamson Machine Tool Company's "Avoidable Costs" replacement formula doesn't. One feature of it is a projection of inflationary factors relating to future labor and material costs, to give a more realistic picture of the potential financial benefits to be gained by using modern production equipment. The projection factors are based on the best available indices of past trends.



In pointing out management's responsibility toward modernizing in another article in this issue, Cross Company's Ralph Cross speaks of the forecast of return on investment as a good method for determining the feasibility of replacing equipment. He mentions, however, that variables such as changing labor and tax costs make accuracy a problem.

The J&L formula, on the other hand, doesn't analyze the replacement project in terms of the rate of return on investment. Nor is it based on the period of time it will take to return the investment or to obtain a favorable cash flow, all established methods of analyzing replacement factors. These, J&L believes, are highly arbitrary. So, they base replacement analyses in terms of avoiding costs which would be incurred if replacement decisions were postponed for one, five, or ten years. Major factors are projections of probable increases in costs and prices for new equipment due to inflation.

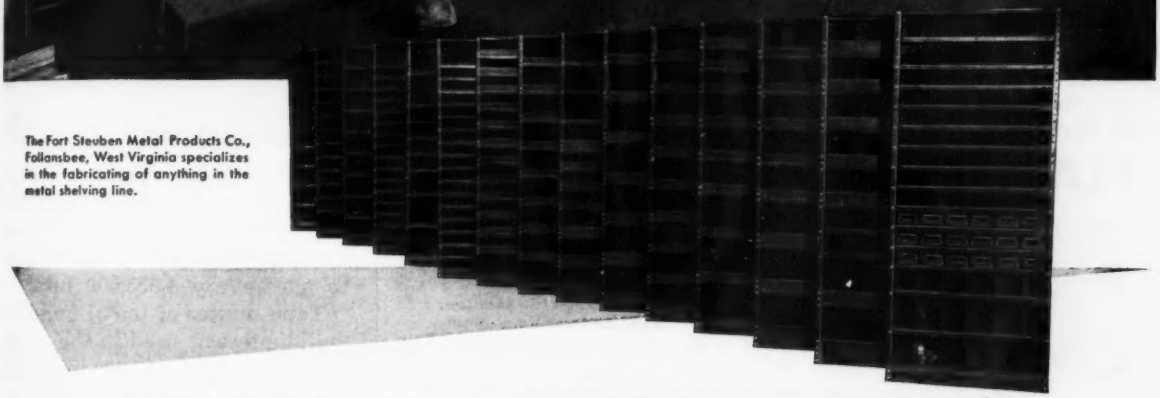
The "packaged" J&L formula (see illustration) requires only simple arithmetic—just collection, comparison, and projection of data on the old and proposed new equipment.

On the first page the proposed replacement is analyzed in terms of avoidable costs (labor, maintenance, power, etc.) for one year. The second page is for listing the avoidable costs (or savings) incurred by postponing the replacement decision. There is space for rating each replacement project against another. This is done by establishing the ratio (percentage) of avoidable costs to the costs of the new equipment, also for the one, five, and ten year periods.

The best way to study and evaluate the Jones & Lamson method is to work with it. If you'd like a copy, circle 78 on the Inform-A-Gram card in this issue.

BATH PRESSES can TAKE IT... Around the Clock!

The Fort Steuben Metal Products Co., Follansbee, West Virginia specializes in the fabricating of anything in the metal shelving line.



Mr. Albert W. Robinson, Vice President of the Fort Steuben Metal Products Company has this to say about Bath Presses:

"Here at Fort Steuben we are more than satisfied with the way Cyril Bath Presses have demonstrated their ability to take it. Operating as we do, sometimes around the clock to keep up with demand for our shelving, we require dependable, rugged equipment. This ruggedness, coupled with large bed area for dollars expended, plus ease of operation and maintenance makes Cyril Bath Presses ideal."

Catalogs are available, without obligation, covering both The Cyril Bath Power Press Brake and P.T. Press line . . . this literature covers important information regarding the features which make BATH Presses your best buy . . . and ask for the Power Press Brake Die Catalog too!

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Manufacturers of Radial Draw Formers • Dies • Tools • Press Brakes • Tangent Bending Sequence Presses • Press Type Brakes • Special Machines

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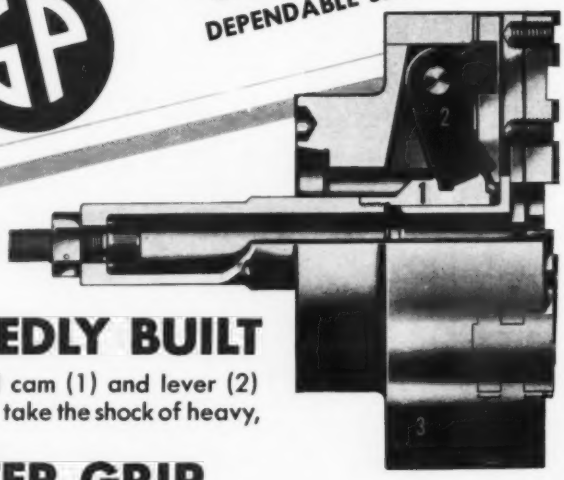
Ruggedly Built for INCREASED SPEEDS • HEAVIER FEEDS

SUPER POWER CHUCKS

DEPENDABLE SINCE 1916



RUGGEDLY BUILT

with improved cam (1) and lever (2) action that can take the shock of heavy, tougher jobs.

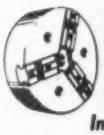
GREATER GRIP

with longer jaw travel, holds work more rigid, resists opening of jaws by centrifugal force for extra safety.

FLAME-HARDENED WAYS (3)

resist wear, prevent bellmouthing.

S-P SELF-CENTERING CHUCKS



Balanced for high rpm; may also be used for internal gripping; American Standard or serrated; 2 or 3 jaws; sizes 6 to 18".

S-P COMPENSATING CHUCKS

Grips out-of-round work with equal pressure on each jaw. American Standard or serrated; 2 or 3 jaws; sizes 8 to 18".

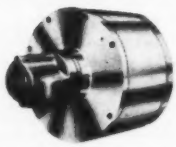
Installed as original equipment by leading manufacturers

SP ROTATING CYLINDERS

Air and Hydraulic

Bore sizes for air: 3" through 16". For hydraulic: 3" through 8" and larger. Speeds up to 3600 R.P.M. American Standard mountings.

AA-9010



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A BASSETT COMPANY • IN GREATER CLEVELAND • ESTABLISHED 1916

POWER CHUCKS • COLLET and DRILL PRESS CHUCKS • ACCESSORIES
Rotating and Non-Rotating AIR and HYDRAULIC CYLINDERS • VALVES

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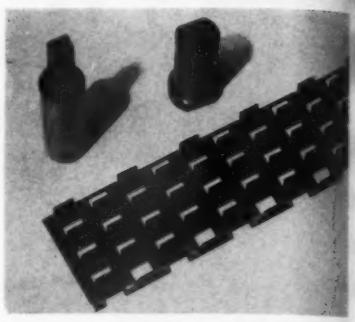
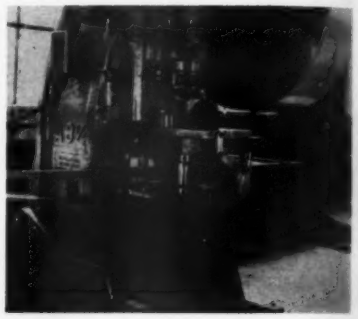
Press Speed Upped With Carbide Dies



Press production of a punched tab surface in 0.28" thick coiled steel stock was more than doubled, and other savings in production costs were realized, after changing from steel to carbide punches and dies at The Air Preheater Corp. The carbide dies



permit stepping up press speed from 80 to 180 spm. Machine downtime and regrinds were thus cut from once every 250,000 hits to once every 4,653,000 hits.

Total service of the 31 punches and die inserts used in the Niagara press was 41,877,000 hits with Kennametal carbide dies, reground eight times, as compared with 2,750,000 hits with steel dies, reground ten times. Stock removal in regrinding both steel and carbide die inserts was 0.020", and stock removal from punches was increased from 0.025" to 0.030" per grind.

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NOW

FOR THE FIRST TIME! REAL INTERCHANGEABILITY IN UNITIZED TOOLING

NEW UNIPUNCH "AJ" Series provides not only INTERCHANGEABILITY with UNIPUNCH Series "A"—but also with units and parts of other leading manufacturers!

In keeping with the UNIPUNCH Series "A" Hole Punching and Notching Units this new UNIPUNCH "AJ" Series has the popular "standard" 8⅜" shut height, 3½" die height and the same maximum capacity of ¼" thick mild steel permitting all these Units to be used in the same setups.

All-steel cast holders produce longer life by combining higher tensile strength and longer wear plus greater bearing surface for punch guides than previously available in this type of holder.

USING PEDESTAL DIES Pedestal Die design is ideal for punching holes in angles, extrusions, channels and formed parts with lips or flanges. Slug chutes in these Pedestal Dies may be directed to prevent piling up of slugs—an important feature in making setups for punching a cluster of round or shaped holes.

USING DIE ADAPTERS UNIPUNCH Type "AJ" Hole Punching Units with Die Adapters provide inexpensive Die Button replacement plus quick, easy interchangeability of standard low-cost die buttons—same as used in UNIPUNCH Type "A" and "B" Hole Punching Units.

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10 TON AIR-HYDRAULIC PRESS

UNIPUNCH PRESS with UNIPUNCH TOOLING punches holes in sheets, angles, channels and extrusions plus notching operations...more economically and more efficiently.

Only UNIPUNCH PRESS has ALL these *features*:-

Exclusive (pat. applied for) hydraulic control provides self-adjusting, self-compensating power stroke with positive stop automatically determined by punch break through in metal, eliminating close ram adjustment when punching various thicknesses of material. Removable ram nose or cap on press ram permits use of detachable vee dies, marking heads and short stroke die sets for small bending and marking operations. Ram can be jogged by foot control.

Simplicity of design (air-hydraulic) • Minimum of moving parts • Operates at 10 tons from 75 pound air line pressure • 100 strokes per minute • 1⅞" ram daylight adjustment • Foot operated control • No double stroking • 15½" throat depth without gauging • Gauging from center of ram to left 24" and front to back 12" (punches to center of 24" sheet) • Gauging equipped with 7 adjustable stops — Optional gauging over 24" available.

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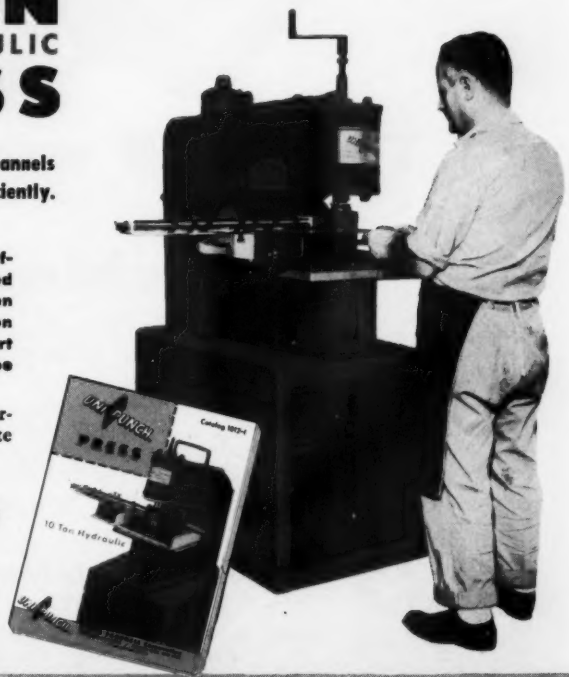

UNIPUNCH AT [illegible] METAL EXPOSITION [illegible] Chicago, Booth 1566

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ALL NEW . . . through and through!

*Also available as a self-contained driving head for use in specially designed assembly machines.

The DPS model U power screwdriving machine

Manufacturing assemblies with small parts? Take note! Detroit Power Screwdriver Company announces the totally new Model U—quickly adaptable for fast, clean driving of screws, nuts and studs.

Scores of advances! An adjustable clutch designed to hold constant driving torques. A hopper drive with built-in slip control to accommodate shock loads. A feed track with quickly adjustable covers, and an escapement mechanism with positive solenoid action permitting release of screw by body or head.

A new folder, too. Write for your copy today.

DETROIT POWER SCREWDRIVER COMPANY 15,033

2827 W. Fort St. • Detroit 16, Michigan

A Subsidiary of Link-Belt Company

CIRCLE INFORM-A-GRAM KEY NO. 82

MEN YOU SHOULD KNOW

Latrobe Steel Co. recently announced the appointment of **K. H. Carlson** as technical manager of specialty steels.

John L. Molner now serves as chief engineer at National Acme Co.

Wilton Tool Mfg. Co. Inc. has announced the appointment of **Alex J. Vogl** to president and **William Ferrick** to vice president and sales manager.

General Manager **Vernon L. Loofboro** has been promoted to executive vice president by Garner Machine Co.

The East Dayton Tool & Die Co. made known the election of **Andrew H. Leingang** to vice president in charge of manufacturing and director of sales.

Factory manager in charge of manufacturing at Vard, Inc., subsidiary of Royal Industries, Inc., is **Paul F. Bruning.**

The Timken Roller Bearing Co. announced recently the promotion of **John B. Baker** to chief engineer, International Divisions, and **Charles L. Richey,** manager of production planning, Domestic and International.

Recently appointed director of engineering at the Aurora (Ill.) Works of Thor Power Tool Co. is **Robert B. Shulters.** At the SpeedWay Mfg. Division, **John R. Bossenga** was appointed assistant to the chief engineer, **Ernie C. Rangue** was promoted to production and tooling engineer, and **Gediminas Bubelis** to chief draftsman.

New manager of the Meta-Dynamics Division of The Cincinnati Milling Machine Co. is **Howard W. Carlisle.** He replaces **E. D. Vancil,** who recently retired.

Promotions at Houdaille Industries include **Emanuel Schugar,** group vice president, and **Russell A. Johnson,** general manager, of Wales-Strippit.

. . . **Continued on page 84**

"MODULE" power units can make your machining operations more profitable with the—

Three Way Savings .....

1 *Accuracy*
spindle speeds
feed speeds
held tolerances

2 *Dependability*
low maintenance
indestructability

3 *Versatility*
"Module" construction
interchangeability
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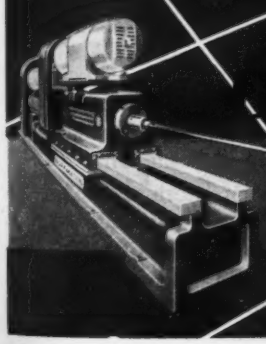
59
"Self-Contained"
"MODULE"
power units



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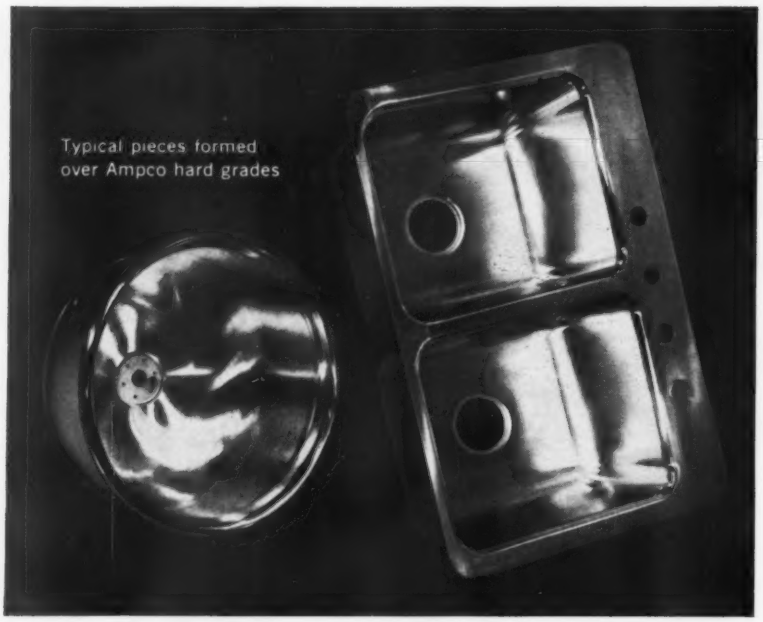
AMPCO®

Ampco® announces a NEW, IMPROVED ALLOY

for drawing and forming stainless steel



DiBronze

(PATENT PENDING)

Longer life between dressings. Improved machining qualities. Better impact resistance.

Now in stock — cast rectangles, solid rounds, centrifugally cast die blanks up to 20" diam.

Also cast to your required shape.

Write for bulletin today.

AMPCO METAL

AMPCO METAL, INC.
Dept. 541
Milwaukee 46, Wisconsin
West Coast plant: Burbank, Calif.
Southwest plant:
Garland (Dallas County), Texas

D-75

CIRCLE INFORM-A-GRAM KEY NO. 84

. . . Men from page 82

Appointment of **S. J. Becker** as vice president and chief engineer of the Spring Division of Borg-Warner Corp. was announced recently.

New chief engineer of the Transducer Division, Consolidated Electrodynamics Corp., is **Howard B. Lewis.** Heading new engineering groups are **James H. Gradin,** Ceramic Products; **Robert R. Mawson,** Potentiometer Products; and **Robert E. Stanaway,** Strain Gage Products.

Now serving as plant manager of the Chicago factory of Dahlstrom Machine Works, Inc., is **Harold A. Williamson.**

The election of **John Moxon** as president and **Frank R. Palmer,** chairman of the board, was recently made known by The Carpenter Steel Co.

Promotion of **William C. Krecklow** and **George J. Slies** to general superintendents in the manufacturing department of the Industries Group has been announced by Allis-Chalmers Mfg. Co.

Taking over as director of Manufacturing at The Martin Co.'s Baltimore Division is **Adolph Vlcek, Jr.** He succeeds **Vernon R. Rawlings,** now general manager of Martin's newly created Activation Division.

Executive Vice President **Jacob J. Jaeger** was recently elected president of Pratt & Whitney Co. He succeeds **Edward P. Gillane,** who moves up as assistant to the chairman of the board.

The advancement of **Herbert DeBorde,** plant manager of Military Electronic Computer Division of Burroughs Corp., to manager of Control Instrument Co., a wholly owned subsidiary, was recently made known.

Recent promotions at The Chicago Screw Co. include **Paul A. Mongerson,** vice president; **W Dean Gwin,** factory manager; and **Henry C. Langille,** assistant chief engineer.

Thread chasing job made 10 times as fast with ROTOR "02" DRILL

JOB: Cleaning out threads after painting of power transformer covers. Formerly hand tapping job . . . slow, and hard on the taps.

RESULTS: Switched to Rotor E-02PR (Pistol Throttle Reversible) Drill with tap chuck. Now breezes through the holes in one-tenth former time. Less operator fatigue. Taps last longer.

Have the nearby Rotor Application Engineer study *your* operations for similar cost-saving possibilities. Write for free copy of Bulletin 53B.

Courtesy Pennsylvania Transformer Division, McGraw-Edison Company, Canonsburg, Pennsylvania.

HAVE YOURS? 100-page handbook for portable air tool users. Request on your letterhead.

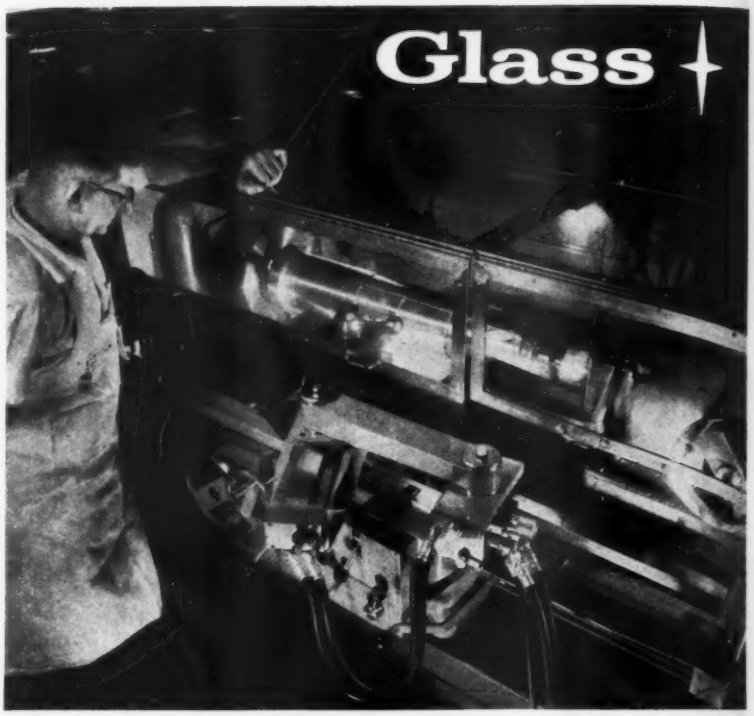
Rotor Air Tools: Assembly Tools • Drills • Small Wheel Grinders Straight Grinders • Vertical Grinders • Scalers • Chippers • Rammers
Rotor High-Cycle Electric Tools: Grinders • Polishers • Sanders

ROTOR TOOLS
CLEVELAND, OHIO

CIRCLE INFORM-A-GRAM KEY NO. 85

Barber-Colman's new 36-speed tracer lathe shows startling results on short-run work. Total costs slashed at speeds which give 30-minute tool life.

Tracing Under Glass



Here is evidence that general-purpose lathes designed for carbide-ceramic speeds are one of the most profitable investments you can make.

The reason lies in the expendability of carbide inserts. Economical machine speeds with throwaways are far beyond those recommended in machinability tables. Speeds between 600 and 900 sfm, calculated to yield 30-minute tool life, reduce *total* cost per piece by as much as 80%.

An example is this 4140 steel forging — 32 in. long by 8 in. max. dia. It is step turned in 6 min. cutting time on a Barber-Colman 36-speed lathe. A hot stream of chips makes it necessary to shield the entire work area, a requirement for which the front-mounted tracer offers definite advantages. Thirteen different diameters are turned and two ends faced at 600 sfm, with .020-ipr feed and 1/4 in. depth of cut. Turning is done by a 1/2-in. triangular carbide insert. Floor-to-floor time is 19 minutes against the former time of 2.1 hours.

The objective in setting feeds and speeds was 30-min. tool life (per edge). But, even at 600 sfm, longer life is experienced due to the machine's unusual rigidity.

More examples . . .

Other jobs being turned at ultra-high speeds include long lead screws — 750 sfm at 1/16 in. depth of cut and .018 ipr feed. The machine turns out three times as much work as two lathes formerly used. In another step-turning operation, tests already prove a 52% gain over the previous time with tracer, and the maximum processed rate has not yet been established. These are savings on jobs averaging 6 to 50 pieces.

Versatile tooling . . .

This hydraulic tracer offers two advantages for increasing utilization of a lathe. *First,* it will duplicate consistently within .001 in. on diameter or length, and it will operate at 90° to the work axis.

Second, the attachment can be removed and replaced by the regular compound in just 20 minutes. This versatility permits economical use of the machine for turning, boring, roughing and finishing, tracing, and both internal and external threading.

Quality features . . .

The lathe itself gives you a new combination of design features that improve performance at high speeds:

(1) Unusual rigidity is provided by the 30 in. span of the front carriage way, scientific bed webbing, 400-lb tailstock, and precision-ground spindle supported at both ends and in the middle by three sets of tapered roller bearings.

(2) Headstock is a dense, Meehanite casting which responds best to vibrations encountered at high speeds.

(3) All headstock gears are hardened and ground.

(4) Automatic pickup on the carriage simplifies positioning of the two-speed tailstock through carriage feed or traverse.

Information . . .

Write today for our new 16-page catalog showing how this new Barber-Colman precision machine can pay for itself quickly as a replacement for an old lathe.

Barber-Colman Company

BARBER COLMAN

97 LOOMIS STREET • ROCKFORD, ILLINOIS

CIRCLE INFORM-A-GRAM KEY NO. 86

Book Reviews

1959 ATOMIC INDUSTRY DIRECTORY. Published by Atomic Industrial Forum, 3 East 54th St., New York, N. Y., 1959. 132 pages, paperbound, $2.50.

More than 200 companies in the nuclear field are listed in this directory and information on their experience, capabilities, and specific products and services supplied is included. Equipment, materials, and services used mainly in the nuclear industry are listed under 40 major classifications.

WHAT EVERY SUPERVISOR SHOULD KNOW, by Lester R. Bittel. Published by McGraw-Hill Book Co., Inc., 330 West 42nd St., New York 36, N. Y., 1959. 451 pages, $7.95.

A knowledge of industrial operations and ability to understand and deal with people are important rungs in the ladder of supervisory success. This book's practical advice on major supervisory responsibilities and problems will be helpful to the man in a new job as well as to the man who is aiming for a better spot in the company. It is written in the form of 700 questions and answers, including: "Does a foreman ever set policy?", "How can you get along best with staff people?", and "When should you ask for a raise?" Helpful case studies are also included.

AUTOMATION AND COMPUTING, by Andrew D. Booth, Published by The Macmillan Co., 60 Fifth Ave., New York 11, N. Y., 1959. 159 pages, $5.

Computing machines and their role in automation are dealt with in this book. A brief history of automation and of analog and digital calculation is followed by a description of the design and operation of calculating machines. The chapter on automatic machine tools and assembly processes outlines practical applications such as programmed milling machines and automatic measurement and inspection setups.

FABRICATION OF MOLYBDENUM. Published by American Society For Metals, 7301 Euclid Ave., Cleveland 3, Ohio, 1959. 221 pages, paperbound, $6.50.

... Continued on page 88

3P CARBIDE
TIPPED Tool Steel Punches

To Improve Punch Life on Tough and Abrasive Materials

In an exclusive process, Porter Precision Products WELDS Tungsten Carbide to the tool-steel. These punches are made to approved ASTE Standards. PORTER GUARANTEES THE STRENGTH OF THE WELD TO EQUAL THE STRENGTH OF CARBIDE ITSELF.

The weld fuses tungsten carbide and tool-steel shank into a perfect metalurgical bond. You can use Porter Carbide Tipped Punches to improve production on all piercing operations. *The Carbide will not come off.*

The Carbide Tipped Punches give longer wear life for all punching jobs, and can be used in your present steel dies—available from stock—immediate delivery.

3P Carbide Tipped Tool-Steel Punches are tough, low in cost, trouble-free, assure longer runs, less downtime, sustained tolerances.

• Write for 3P Catalogue No. 200.

PORTER PRECISION PRODUCTS
P.O.B. 208 CINCINNATI 15, OHIO

CIRCLE INFORM-A-GRAM KEY NO. 87

Book Reviews . . .

. . . Continued from page 87

The state of the art of molybdenum fabrication is thoroughly covered in this collection of 18 papers by specialists in the field. Forming, welding, protection, and coating techniques are outlined and illustrated. There are chapters on welding, brazing and machining of molybdenum and its alloys, all containing helpful information for users of this high temperature metal.

STANDARDIZATION—WHAT'S IN IT FOR ME? Published by American Standards Association, 70 East 45th St., New York, N. Y., 1959. 128 pages, paperbound, $4.50.

The dollars and cents value of standards to the machine tool and related industries is spelled out in one of the papers included in these proceedings of ASA's 1958 Conference on Standards. Short talks by 50 authorities from industry, government, and science explain why more standards are urgently needed to cut costs in purchasing, design, and engineering. The book includes many company case histories of profitable standardization, ranging from pump impellers to ball bearings and throw-away carbide inserts.

SPACE GUIDE, edited by Vincent F. Callahan, Jr. Published by Vincent F. Callahan, Evans Buildings, Washington 5, D. C., 1959. 150 pages, paperbound, $10.

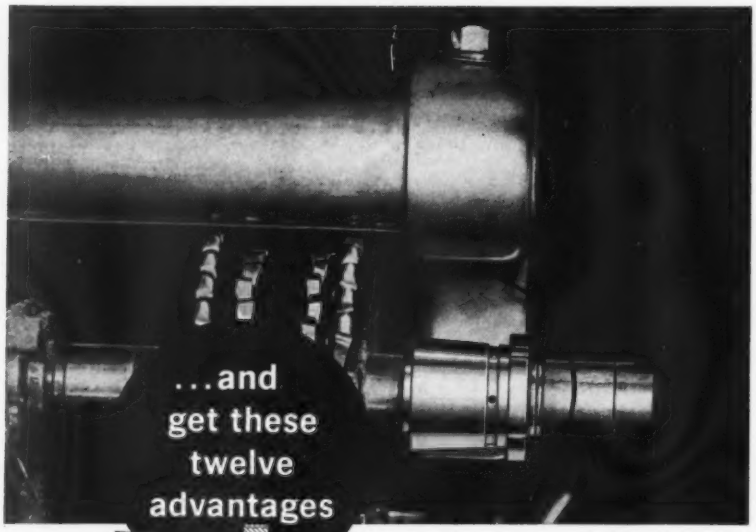
Research, development, production, and procurement activities of the National Aeronautics and Space Administration (NASA) are outlined in this book, especially valuable to companies interested in obtaining space age contracts. Included are official organization charts, field office procurement procedures and activities, and a list of proposed projects.

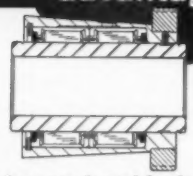
THE COOLING CHARACTERISTICS OF CUTTING FLUIDS, by M. C. Shaw, N. H. Cook, and P. A. Smith. Published by American Society of Tool Engineers Research Fund, 10700 Puritan Ave., Detroit, Mich., 1958. 50 pages, paperbound, $.75 to ASTE members; $1.50, non-members.

This report is an account of two years of research at M.I.T. aimed at devising a way to measure cooling characteristics of cutting fluids under actual cutting conditions. The authors found that chip curl is an important factor and that, in some cases, a fluid can be too good a coolant. These and other results discussed in detail in the report are valuable additions to the scientific knowledge of metalworking.

CIRCLE INFORM-A-GRAM KEY NO. 89→

Replace the bronze bushing in your MILLING MACHINE ARBOR SUPPORT with a Sonnet ROLLER BEARING





- Faster speeds and feeds
- Maximum rigidity
- No chatter
- No bearing heating
- No bearing seizure
- No twisted arbors
- Longer cutter life
- Utilizes machine's lubrication system
- Increased production
- Better finishes
- Less maintenance
- Faster set-ups

Installed in minutes without machine rework. Requires no extra space; no adjustments. Extra sets of bushings provided to accommodate different size arbors. Permits full range of speeds and feeds of late model milling machines. Carbide cutters can be fully utilized.

Write for catalog.

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TOOL & MFG. CO.
580 North Prairie Avenue
Hawthorne, California

CIRCLE INFORM-A-GRAM KEY NO. 88

Three 45 ton Clearing Torc-Pac O.B.I.'s at Amphenol-Borg's Chicago plant. Torc-Pac O.B.I.'s are standard in 22, 32, 45 and 60 ton capacities.

These Clearing Torc-Pac Presses at Amphenol-Borg have something you should know about

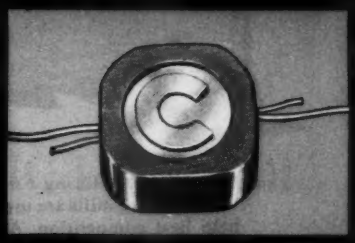
If you operate presses, you know that clutch and brake maintenance can be at least an annoyance—at worst, a stumbling block in your entire production schedule.

With that fact in mind, consider these Clearing Torc-Pacs which have been helping the Amphenol Connector Division of Amphenol-Borg meet tight production schedules on classified government work. They are certainly clean looking presses. There are no overhanging gears or flywheels so that there is a maximum amount of floor space for easy material handling.

But what you can't see is that the drives are sealed: That's right, sealed—a point that demonstrates the trouble free character of these presses.

CLEARING GUARANTEES THE DRIVE OF TORC-PAC PRESSES FOR 18 MONTHS IF THE SEAL HASN'T BEEN TAMPERED WITH

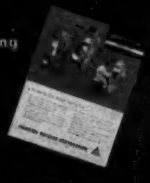
There are a great many more plus features about the Clearing Torc-Pac. Write for free descriptive literature.



Would any other press manufacturer dare to seal their press drives in this manner? Find out about the remarkable Torc-Pac and how Clearing can actually seal the drive.

Clearing division of U. S. Industries, Inc. manufactures power presses of all types, Clearing-Axelson and Clearing-Harrison lathes, dies and special tooling, and special equipment for the aircraft and missile industry.

Write for further engineering facts on Clearing's line of Torc-Pac O.B.I.'s.



USI Clearing

DIVISION OF U.S. INDUSTRIES, INC.

6499 W. 65th Street, Chicago 38, Illinois

Flick-Reedy's Plant Goes Ultra Modern

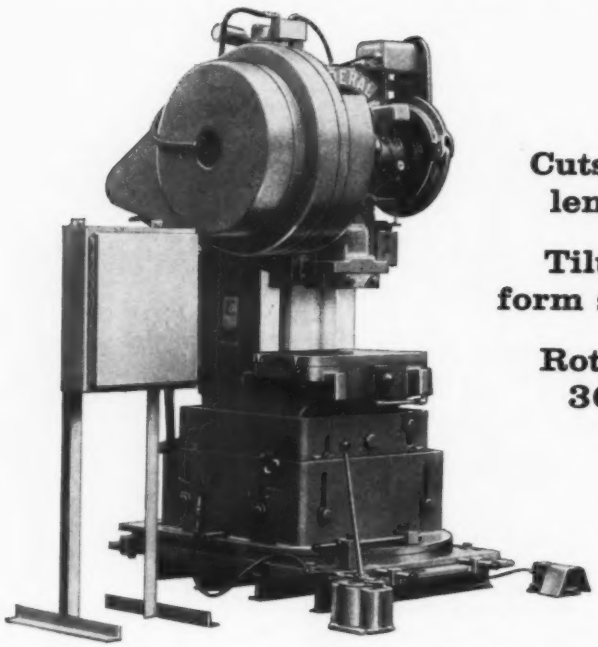
There are no secrets at Flick-Reedy's new plant in Bensenville, Ill., which uses glass partitions between offices and the office and plant so employees know what's going on in both sections.

The ultra-modern structure, housing the Miller Fluid Power Division and the True-Seal Division, boasts some unusual features, including swimming pool, recreation area for dances and games, and a lounge—all for the use of employees and community groups. The 220,000-sq-ft building will be heated in winter and cooled in summer by the world's largest heat pump.

New FEDERAL

"FLYING CUTOFF"

boosts output–reduces costs!



Cuts any length

Tilts to form shapes

Rotates 360°

Federal's new "Flying Cutoff" is adaptable to a variety of operations where rolling mills are used. It can double production . . . cut costs . . . help beat competition. Air-clutch control panel synchronizes press and mill speeds — permits cutting bars, channels, mouldings, angles and other shapes to *any length*—continuously. Custom fabricated base provides 360° rotation. Hydraulic power permits tilting at any angle. One-piece, machine tool grade cast iron frame, finest workmanship and other Federal features assure stamina for the most grueling jobs. Up to 100-ton capacity. Write for case histories and catalog today!

FEDERAL PRESS CO., 907 Division Street, Elkhart, Indiana

FEDERAL Open Back Inclinable PRESSES

34 Years of Quality Construction

CIRCLE INFORM-A-GRAM KEY NO. 90

Florida Opportunity

WE WERE DELIGHTFULLY SURPRISED recently to receive a letter from a friend of many years' standing — and whom we thought had retired "out of" metalworking — John R. Fitzsimmons, founder and long time head of Cleveland's Die Supply Company. Over the years, "Fitz" and his sons built a successful business serving the needs of the tool and die industry.

As to his retirement, he said "I am tired of loafing." He is keeping busy now furthering the industrial interests of Florida. His letter goes on:

"I am working with the Sebring Airport Authority and we have several unoccupied buildings which are available at very reasonable rentals. I know there are a number of shop owners in the Northern States who would grab this space at once if they knew about it.

"One, 3700 sq ft floor space—$150 monthly rental;

"One, 9200 sq ft floor space—$350 monthly rental;

"Several smaller spaces at cheap rent.

"We need more jobbing machine shops, production machine shops, and tool and die shops in Florida. Sebring is centrally located, not too far from places like Jacksonville, Orlando, Cape Canaveral, Tampa, St. Petersburg, West Palm Beach, and Miami.

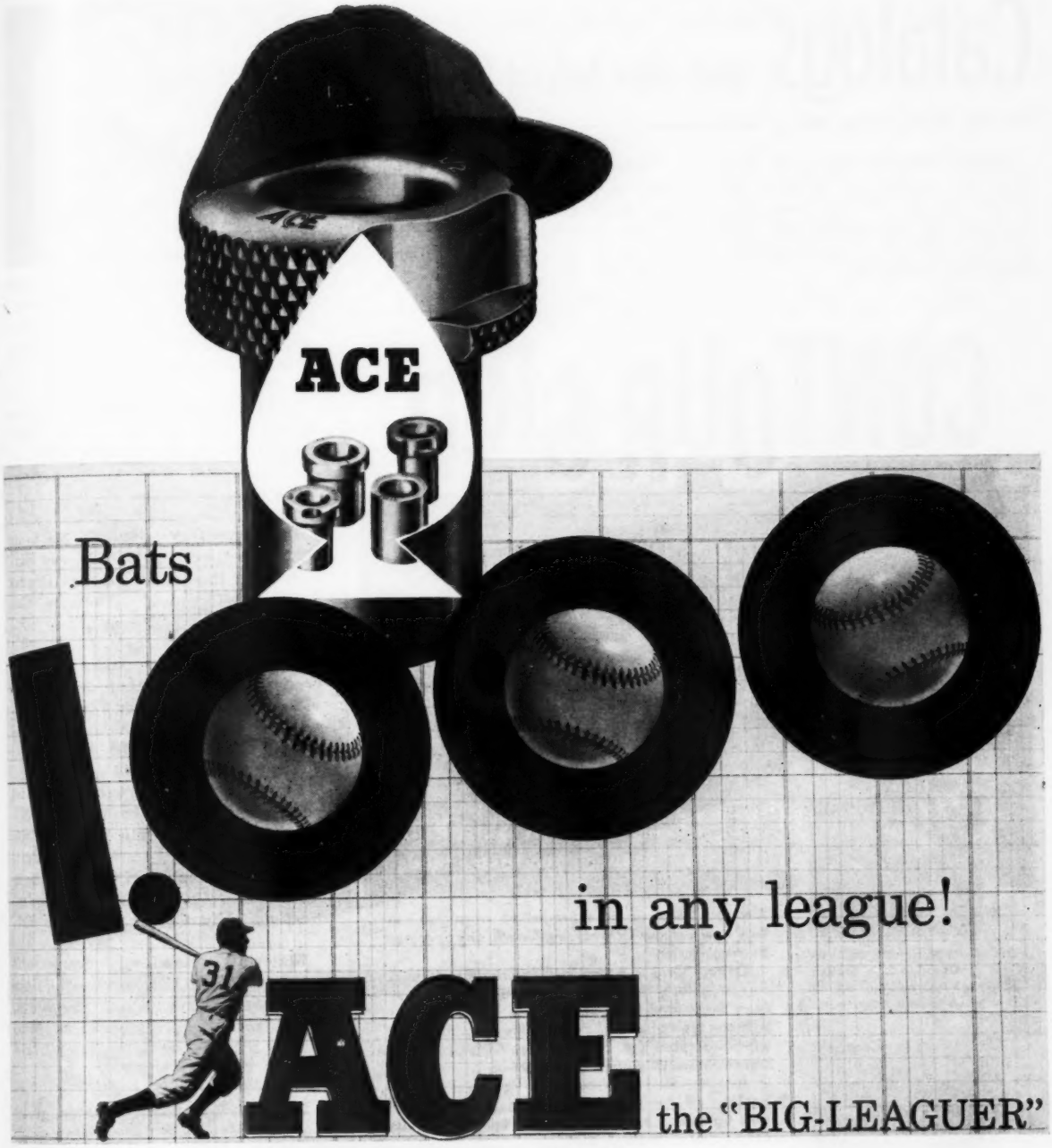
"At the airport here, we have plenty of water, the Florida Power Corp., and bottled gas.

"There are several former shop owners from the North now operating in Florida.

"A live operator could enjoy this climate and get plenty of work to do."

Thank you, Fitz! We're mighty glad to know that you are well, happy, and busy. Maybe some Southward-bound reader of Tooling & Production can use a few of your square feet!

—E. W. P.



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CIRCLE INFORM-A-GRAM KEY NO. 91

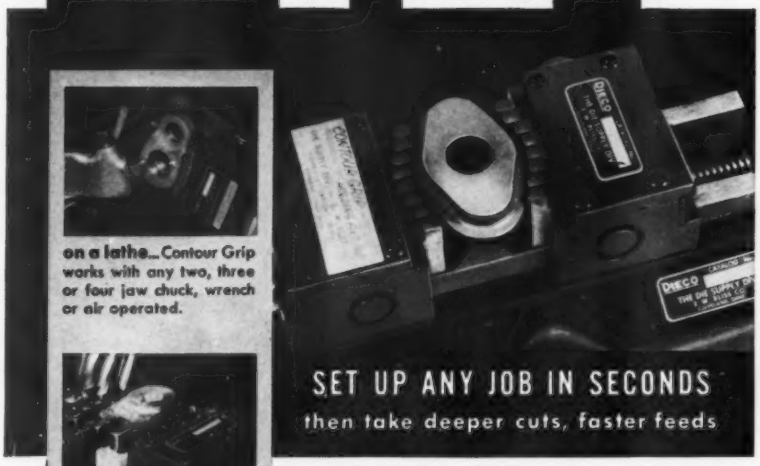
Catalogs and other helpful literature

Use the Inform-A-Gram Card to obtain copies

Capture Dust or Mist with Dustkop dust collection systems described in a bulletin that gives specifications and applications for many models. Aget Mfg. Co., or Circle Inform-A-Gram No. B1.

"Electron Drills" shows different models for use in small, medium, and large plants for machining odd shapes, salvaging parts, and drilling holes. Elox Corp. of Michigan, or Circle No. B2.

CONTOUR GRIP



SET UP ANY JOB IN SECONDS
then take deeper cuts, faster feeds

on a lathe... Contour Grip works with any two, three or four jaw chuck, wrench or air operated.

on a milling machine ... Contour Grip makes high speed milling of tough-to-hold parts easy.

on a grinder...this multiple set-up on a Blanchard helped a manufacturer increase his output ten-fold!

Any tool becomes more productive when you use Bliss' new Contour Grip holding fixture; any operator becomes faster.

Contour Grip is a standard fixture that will hold any irregularly shaped part so tightly that you can feed faster and take deeper cuts. It can be used with *any* type of tool, eliminating the need for costly special-purpose jigs and fixtures. And, as picture above shows, your operator can set-up Contour Grip in seconds, then go from piece to piece just by backing off the jaws, dropping the next piece in and tightening up. For long runs or short, it's as simple and as quick as that.

The key to this all-purpose holding fixture's versatility is its individual steel fingers, each of which moves independently as it contacts the work. The fingers mold around the part, and then tighten up *giving greater holding power and a more positive grip than any ordinary fixture can.*

To learn how Contour Grip works and to see the various models available, see your local dealer or contact us direct.

SEND FOR BULLETIN

dieco DIE SETS

E. W. BLISS COMPANY
DIE SUPPLY DIVISION
1400 Brookpark Road
Cleveland, Ohio

Available in Canada through John Bertram & Sons, Ltd., Dundas, Ontario.
CIRCLE INFORM-A-GRAM KEY NO. 92

A 12-Page Bulletin "Efficient Tooling for the Appliance Industry," shows dies, fixtures, and prototype parts made under contract by Tool & Die Co., or Circle No. B3.

"Solid Carbide Fluted Tools" lists 15 styles with 1/16" to 3/4" dia. Catalog 559, Sec. 1, shows two, three, or four flute and other types. Kennametal Inc., or Circle No. B4.

Die Inventory Control Methods that save time and trouble, are discussed in the latest Die Set Digest from The Producto Machine Co. Circle No. B5.

Chatterless Countersinks are covered in a bulletin that gives individual specifications and prices. Severance Tool Industries Inc., or Circle No. B6.

Low Cost Tooling with standard power tools is presented in a 66-page case book. Single- and multiple-spindle and automated drill presses are explained. Data sheets included. Delta Power Tool Div'n., Rockwell Mfg. Co., or Circle No. B7.

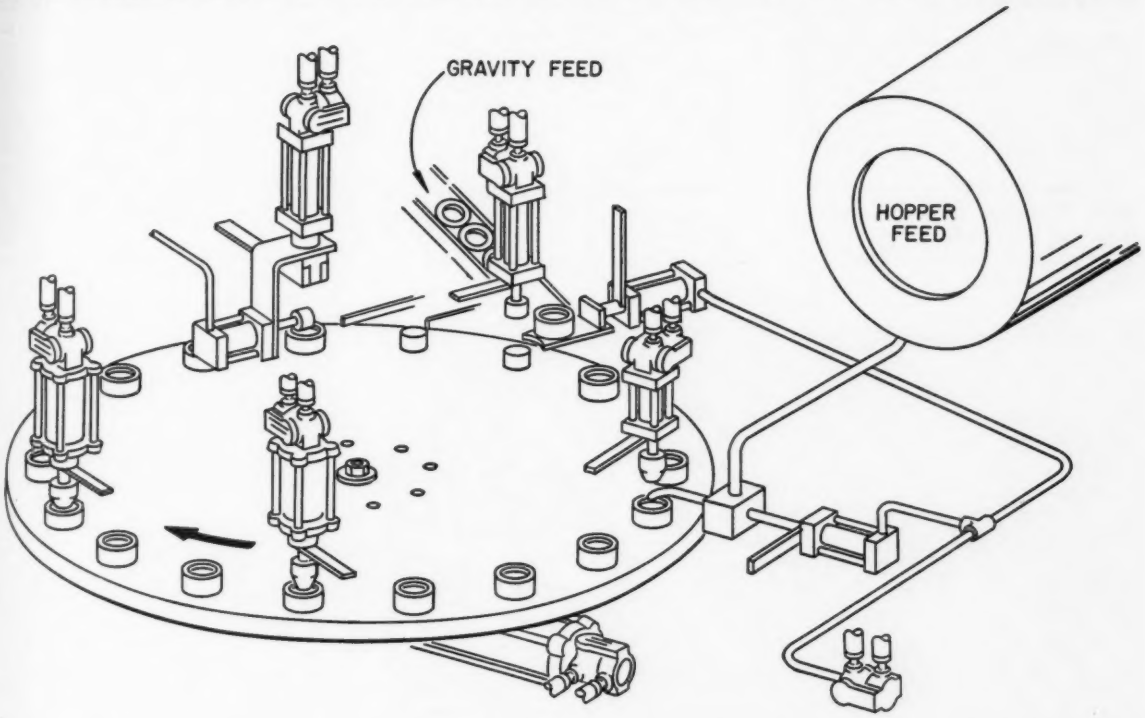
Materials Handling equipment Catalog No. 596 has 68 pages of data on vibrators, packers, and jolters, flow control valves, feeders, and conveyors. Syntron Co., or Circle No. B8.

A Threading Lathe Catalog gives specifications and applications of Model B high-speed semi-automatic, single-point types. Gisholt Machine Co., or Circle No. B9.

"Automatic Screw Machining of Aluminum," a 32-page reference, contains data on all phases of machining aluminum to best advantage. Request on letterhead — Reynolds Metals Co., Dept. PRD-10, Box 2346, Richmond 18, Va. B10.

Twenty-Two Floor Model Presses and six bench models are featured in a catalog. Punching and shearing data included. Service Machine Co., or Circle Inform-A-Gram No. B11.

THIS BELLOWS "SPOT-A-MATION IDEA" SAVED $82,754.00



Engineers at the Naval Ordnance Plant, Macon, Georgia, were given the assignment to "effect major production economies" in the assembling of explosive components for ordnance use. The operations were being performed manually by 33 people. The engineers designed and built two automatic assembly machines, each using a Bellows Rotary Index Table and five explosion-proof Bellows Air Motors. The savings on direct labor costs alone on one contract amounted to .0109 man-hours per assembled part for a total dollar savings of $82,754.00.

This same basic idea can be readily adapted to handle an almost unlimited range of small parts assembly procedure: staking, crimping, screw or stud placement, welding partial or complete small assemblies, etc.

It is typical of the many ways ingenious engineers "spot-automate" costly and troublesome production centers with Bellows "Controlled-Air-Power" Devices.

Chances are that many such opportunities exist in your plant. Why not investigate today?

Air Force Photo by Robins AF Base, Ga.

The savings of $82,754.00 made through these automatic assembly units are based on direct labor costs and are exclusive of any possible savings from reduced overhead. In addition, 1000 sq. ft. of floor space was released for other operations.

THIS "SPOT-A-MATION IDEA" FILE IS YOURS ON REQUEST

Contains installation data, wiring diagrams and equipment lists for the assembly idea sketched above, as well as a score of other "Spot-a-mation" ideas you can use. Write Dept. TP959, The Bellows Co., Akron 9, Ohio.

1492-B

The Bellows Co.

DIVISION OF INTERNATIONAL BASIC ECONOMY CORPORATION (IBEC)

AKRON 9, OHIO

OTHER INDUSTRIAL DIVISIONS OF IBEC: Sinclair-Collins Valve Co., Valvair, Akron, Ohio • V. D. Anderson Co., Cleveland, Ohio

CIRCLE INFORM-A-GRAM KEY NO. 93

Catalogs . .

Processed Reflectors for the optimum in light reflection are presented in a bulletin. Applications, characteristics, and specifications are given. Aluminum Co. of America, or Circle Inform-A-Gram No. C1.

"Carbide Grinding with Man-Made Diamond Wheels" contains facts and recommendations on man-made diamond wheels. The Carborundum Co., or Circle Inform-A-Gram No. C2.

Automatic Roll Marker and manual marking devices are pictured in new Catalog MA-59. Complete specifications are given for many models. New Method Steel Stamps, Inc., or Circle No. C3.

Die Protection Ideas are given in literature which tells how one switch detects misfeed in progressive die and another prevents die smash-up due to faulty pressure pad. Micro-Switch Div'n, Minneapolis Honeywell Regulator Co., or Circle No. C4.

A New OBI Press line, Series AF, is highlighted in a bulletin that describes all parts including the featured electro-pneumatic friction clutch. Bulletin 55 available from Niagara Machine & Tool Works, or Circle Inform-A-Gram No. C5.

Standard Boring Bar individual elements are listed by a new system in a catalog. Both general-purpose and production bars for either line or stub boring operations are found in Catalog D-520 from Giddings & Lewis Machine Tool Co., Davis Div'n, or Circle No. C6.

A New Lorco Vibrator is introduced in Bulletin 1930E that gives dimensions and construction features of the 15-hp model. Lord Chemical Corp., or Circle No. C7.

Famco Mills with three directional power feed are discussed in a bulletin. A new feed and operating directions are included. Famco Machine Co., or Circle Inform-A-Gram No. C8.

IF IT'S
DURABLE
IT'S
DEPENDABLE
Durable Punch & Die Company is your one best source of information regarding metal and plastic piercing applications. Durable's engineering knowhow helps solve perforating problems. Durable's perforators punch straight holes to reamer accuracy; hold close tolerances; perforates at angles; pierces round stock. They too have proven their value in cold piercing straight, burr free holes in Phenolic laminated plastics. Durable perforators give longer punch life because they are completely supported, vertically lapped and chrome plated to retard firing and galling, and to provide for easier stripping.
Write for Durable Engineer's Handbook. 121 pages, 100 illustrations. No obligation.
Patented and made exclusively by
DURABLE PUNCH & DIE COMPANY
9030 South Hermitage Ave., Chicago 20, Illinois
CIRCLE INFORM-A-GRAM KEY NO. 94

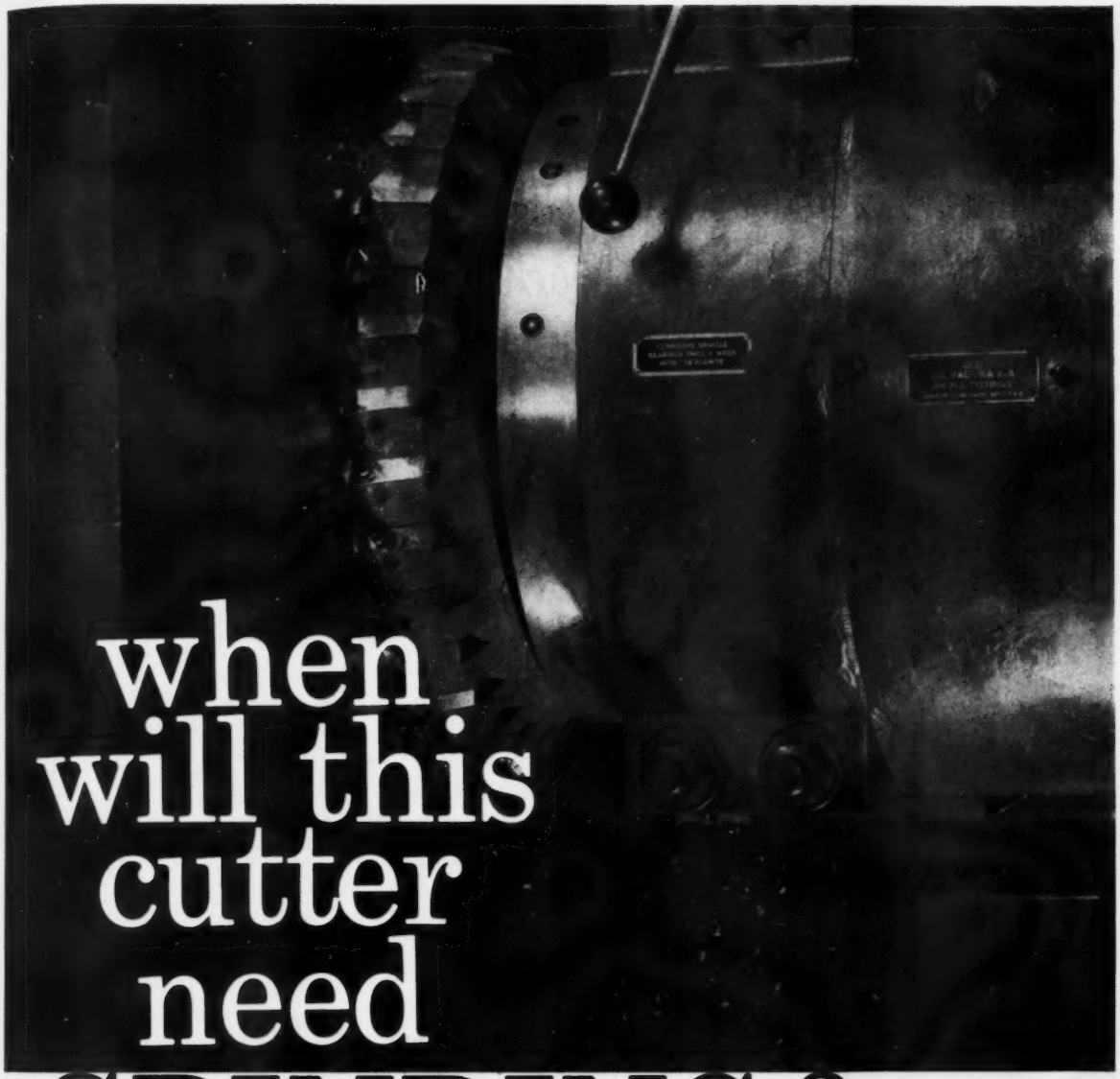
PRICES DOWN ON PLATES

A general price reduction and improvements in its line of T-slotted plates have been announced by Wales-Strippit, Inc., Akron, New York. They're made of special low-carbon rolled steel and available in 12″, 18″, 24″, and 30″ widths, to be used for mounting setups of independent Strippit punching and notching units.

An Automatic, Adjustable Parts Escapement Device is fully described in a bulletin that includes data and specifications for air- or solenoid-operated escapements. Syntron Co., or Circle Inform-A-Gram No. C9.

"Properties of Republic Type 6460 Alloy Powder" is a 14-page catalog that gives applications for the metallurgy powder, properties, and performance charts. Republic Steel, Metal Powder Div'n, or Circle No. C10.

"Cam Operated Indexing Units" is a comprehensive catalog that gives dimensional diagrams of the basic units and applications. Includes specifications and load rating tables. Standard Tool & Mfg. Co., or Circle No. C11.



when will this cutter need GRINDING?

When the blades get dull, of course.

But when is a cutter blade dull? At what degree of dullness does it begin to consume increasingly more horsepower and produce inferior finish? At what point does grinding prolong blade life?

Knowing *exactly* when to grind cutters is just one of the many variables that vitally affect performance and costs.

Our specialty is working with these variables—to furnish the most economical solutions to milling and boring problems, including grinding techniques, through the use of inserted blade cutters.

We study machine, work piece, feed rate, depth of cut, speed and finish requirements. And only after pooling this information with the customer's specialized knowledge of his own work is any cutter recommended.

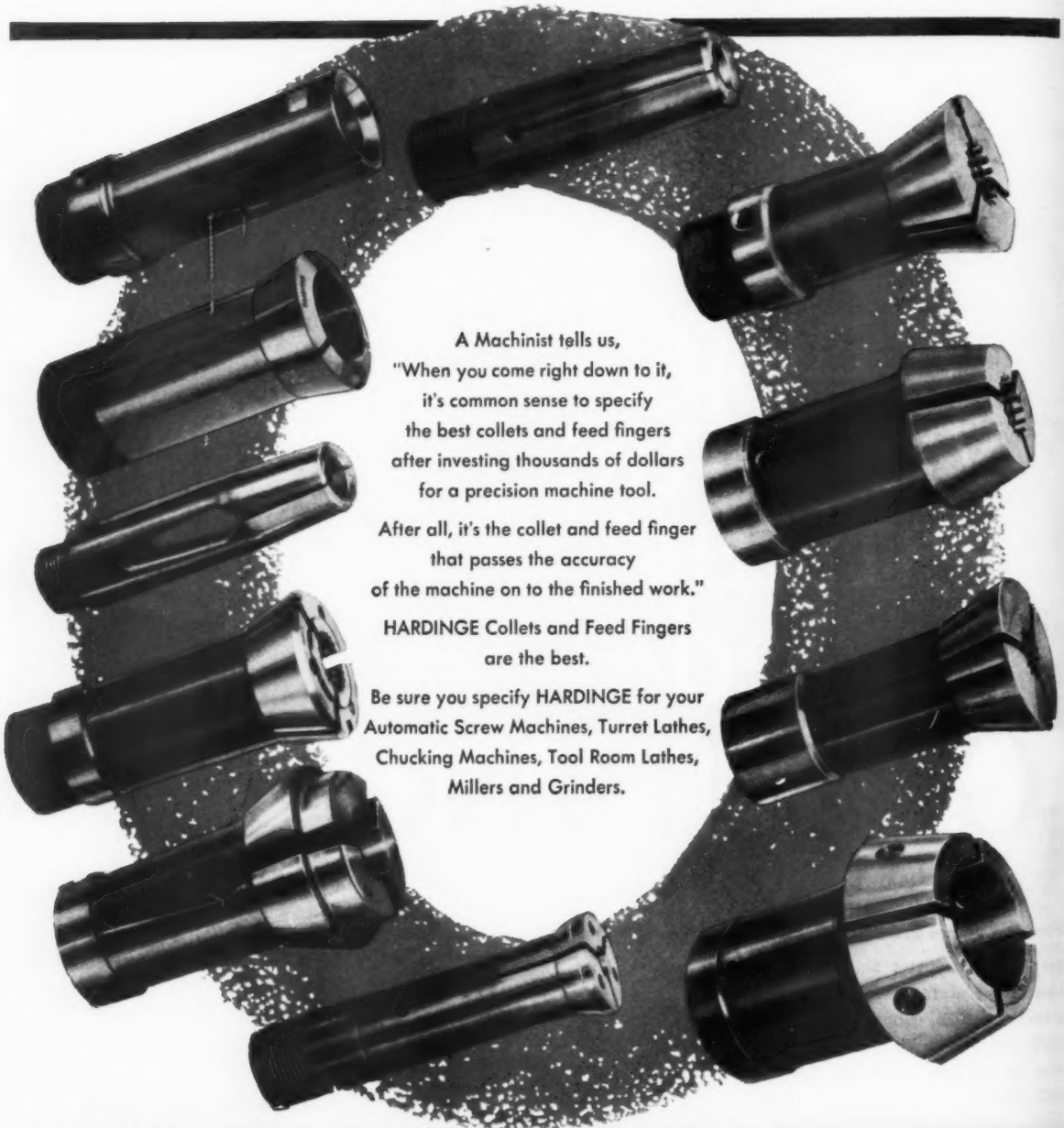
We would appreciate the opportunity to tell you more about this unique cutter selection service. Write:

This helpful new booklet tells you how to reduce the cost of chips and improve your milling and boring performance. Ask for a free copy of booklet No. 68H.

THE
INGERSOLL
MILLING MACHINE COMPANY
CUTTER DIVISION
505 FULTON AVENUE • ROCKFORD, ILLINOIS

CIRCLE INFORM-A-GRAM KEY NO. 95

Specify HARDINGE ELMIRA, N.Y. Collets and Feed Fingers and Get the MOST from your Investment in Machine Tools



A Machinist tells us,
"When you come right down to it,
it's common sense to specify
the best collets and feed fingers
after investing thousands of dollars
for a precision machine tool.

After all, it's the collet and feed finger
that passes the accuracy
of the machine on to the finished work."

HARDINGE Collets and Feed Fingers
are the best.

Be sure you specify HARDINGE for your
Automatic Screw Machines, Turret Lathes,
Chucking Machines, Tool Room Lathes,
Millers and Grinders.

HARDINGE BROTHERS, INC., ELMIRA, N. Y.
"PERFORMANCE HAS ESTABLISHED LEADERSHIP FOR HARDINGE"

Immediate stock delivery from Elmira, Boston, Atlanta, New York, Hartford, Philadelphia, Rochester, N. Y., Dayton, Detroit, Minneapolis, Chicago, St. Louis, Oakland, Portland, Seattle, Los Angeles, and Toronto.

CIRCLE INFORM-A-GRAM KEY NO. 96

"Cam Operated Indexing Units" gives dimensions for models ST-A9B, ST-A9C, and ST-A9D. Detailed diagrams of mounting positions and loading rate tables included. Standard Tool & Mfg. Co., or Circle Inform-A-Gram No. C12.

"Edgiloy . . . a Cobalt Nickel Spring Alloy," a 25-page handbook, gives technical facts, properties, and applications. Elgin National Watch Co., or Circle No. C13.

Anti-Friction Arbor Bearings are offered in Bulletin AB-57-1 that presents advantages, uses, and dimensions. Briney Mfg. Co., or Circle Inform-A-Gram No. C14.

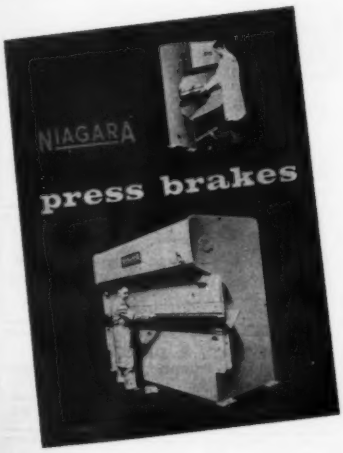
A 76-Page Booklet, "Slitting Lines for Coils and Sheets," features design, selection, operation information, analysis of operating cycles, and specifications. The Yoder Co., or Circle No. C15.

Balancing Machines with single level control are featured in a bulletin. Three models with from 1-oz to 400-lb capacities are described. Bear Mfg. Co., Industrial Div'n, or Circle No. C16.

Standard Circular Form Tools for B&S screw machines are listed in a bulletin. Different styles are shown with dimensional drawings. George L. Detterbeck Co., or Circle No. C17.

Jigs and Fixture Components are pictured in a 26-page catalog along with complete specifications. Carr Lane Mfg. Co., or Circle No. C18.

Press Brakes, 15, 30, 60 tons, are introduced in an 11-page bulletin



that includes features, uses, and dimensional drawings. Niagara Machine & Tool Works, or Circle C19.

Cut-Off Machines and automatic loaders, hot spinning machines, and safety drill tables are highlighted in a bulletin that shows how multiple operations are possible with the cut-off machine. Modern Machine Tool Co., or Circle No. C20.

Multicut Tracer Tools that use standard 55° diamond-shaped throw-away carbide inserts are offered in Bulletin 459. Applications, dimensions, and tolerances given. Wesson Co., or Circle No. C21.

"Sleev-Lock, the Versatile High Strength, Blind Fastener" introduces design and application data on this new fastener. Standard Pressed Steel Co., or Circle Inform-A-Gram No. C22.

Steel Tubing Tolerances detailed in Chart Sec. B, No. 1, include both seamless and welded mechanical tubing and seamless and welded stainless steel tubing and pipe. Peter A. Frasse & Co., Inc., or Circle Inform-A-Gram No. C23.

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PRECISION HYDRAULIC POWER

FOR METAL FORMING and DRAWING

From Rodgers "Standard" Line
Select your "Custom" Model

Easy as A B C:

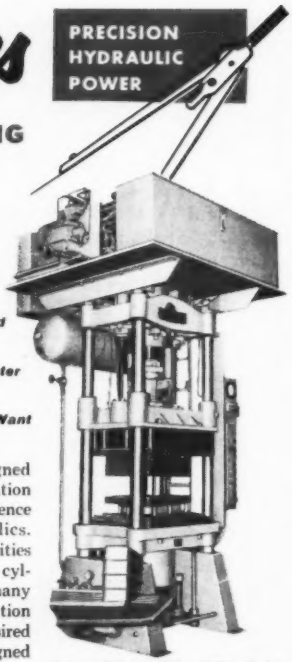
A — *Determine Press Tonnage and Style Press You Need*

B — *Bed and Frame Size Required . . . Solid or Open Bolster*

C — *Select Pump Unit and Controls To Give Speed You Want*

The New Standard line of Rodgers Platen Presses has been designed to greatly simplify press selection. From the basic press styles, one may be selected and combined with varied pumps and controls, automatic, semi-automatic or pressure sensitive, to give the desired speed and performance. This results in savings of "custom" engineering and costs.

Rodgers Presses are designed and built by an organization with over 32 years' experience in high pressure hydraulics. They are available in capacities from 50 to 400 tons, single cylinder or twin cylinders, in many standard models for production or special uses. Where desired custom models will be designed to suit exacting special requirements.



Rodgers 100 ton 30" x 30" bed size with complete one cycle automatic control for deep drawing.

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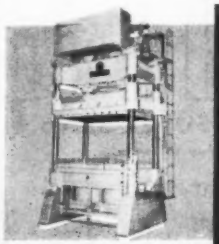
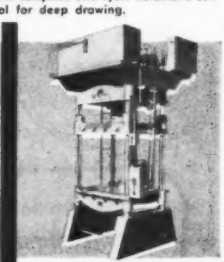


Rodgers twin cylinder, twin die cushion 200 ton drawing press with 60" x 48" bed; single cycle automatic.



Rodgers 100 ton press, 36" x 36" bed with single lever pressure sensitive manual control.

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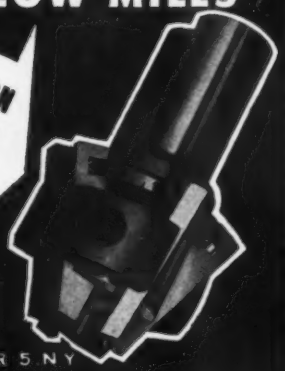

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"The Spiral Point—A New Era In Drilling," Catalog SP-165, describes new Spiral Point geometry for converting standard twist drills into precision tools. Cincinnati Lathe and Tool Co., or Circle Inform-A-Gram No. C24.

"Presses for Profitable Automatic Production" discusses advantages of automatic production in the metal stamping industry and shows six installations. The Minster Machine Co., or Circle No. C25.

"End Measure Jig Borers" is a 28-page catalog that gives dimensions, advantages and operation of various types of jig borers. Pratt & Whitney Co., Inc., or Circle No. C26.

Select Dust or Mist Collectors from a new brochure that gives specifications for models used on grinding, buffing, or polishing machines. Get a copy from Aget Mfg. Co., or Circle No. C27.

Dimensionair Air Gage Systems catalog contains 32 pages of specifications, applications, and features. Also details operation. Get Catalog 59D from Federal Products Corp., or Circle No. C28.

Tapping Attachments for machines with reversing or non-reversing spindles are discussed in a bulletin. Dimensions for these and Morse taper and straight shank arbors are included. Get a copy from Tapmatic, or Circle No. C29.

Standard Way and aluminum-bronze way cross section sizes are listed and discussed in a new catalog that gives stock specifications for all products. Get a copy from The Ohio Knife Co., or Circle Inform-A-Gram No. C30.

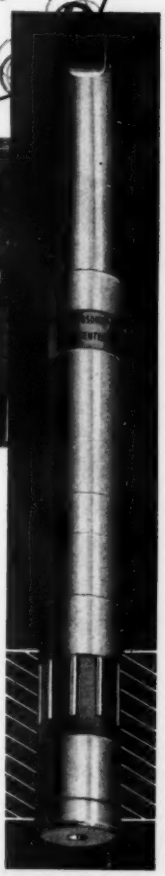
"The New International Inch and How It Will Affect Your Operations . . ." discusses the problems involved and some hints to help decide if you should adopt the new inch. Get a copy from Pratt & Whitney Co. Inc., or Circle No. C31.

Buffing and Polishing Compounds are discussed in a 20-page bulletin which describes over 150 compounds and their applications. Bulletin Co-104 is published by Hanson - Van Winkle - Munning Co., or Circle Inform-A-Gram No. C32.

"Miscellaneous Tools" is a 24-page catalog containing information on chucks, collets, stud setters, floating tap sleeves, and special fastening tools. The Apex Machine & Tool Co., or Circle Inform-A-Gram No. C33.

A General Purpose Computer is outlined in a bulletin which gives specifications and basic features, illustrates major components, and lists applications. Bulletin S-526R1 is available from Royal McBee Corp., Data Processing Div'n., or Circle No. C34.

4 PIECES in 8 SECONDS to .0002" 7 MICROINCHES



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CIRCLE INFORM-A-GRAM KEY NO. 99

NEW 2-WAY TRIGGER RELEASE

Model 462 illustrates how only one hand easily releases clamp by pressing trigger toward either handle. This patented feature available on many De-Sta-Co Portables.

IF YOU CAN REACH IT— A DE-STA-CO Portable Will Clamp It!

Hundreds—yes, thousands—of awkward clamping problems have been brought to us for solution in our 40 years of leadership. Many of these have been solved by De-Sta-Co Portable Clamps. You now have a selection of two dozen basic models, a variety which masters almost any conceivable portable, blind or awkward clamping operation. To add to the versatility of all our portables, there's a complete line of accessories. Features which may aid you in your next problem are

1. ***Two way trigger releases*** **on numerous models**
2. ***Deep jaws and wide spans***
3. ***Flexi-matic and Pressure-matic spindle adjustments***
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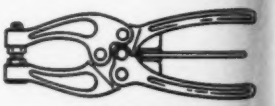
5. ***Light weight models*** **for continuous frequent handling**

Compact models

Self-adjusting models



Deep jaw models

Pressure-matic—wide span

De-Sta-Co Portables lend themselves to special adaptations for that "insurmountable" problem.

Standard portables offer jaw openings ½″ to 6″, throat depths to 3½″, pressures from 35 lb. to 1200 lb.

Send for the De-Sta-Co catalog with details on over 130 types, sizes and models of portable and *fixture* clamps. We'll send you the name of our stocking distributor in your area. He is ready and qualified to assist you with your clamping problem.

De-Sta-Co is widely known for toggle clamps, stampings, precision washers, spacers, shims, shim and feeler stock, blower housings and marine specialties.

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DETROIT STAMPING COMPANY

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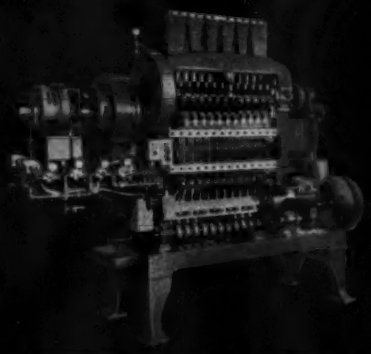

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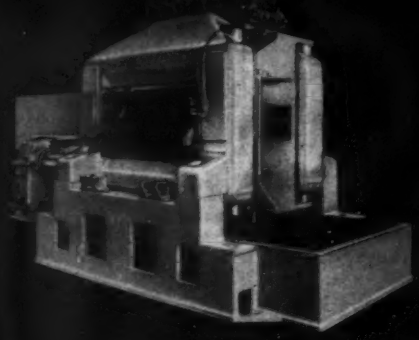

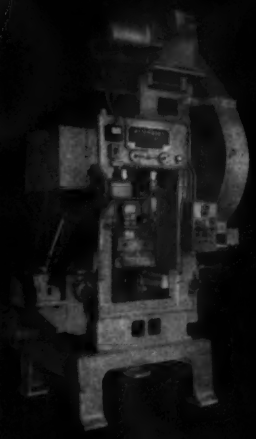

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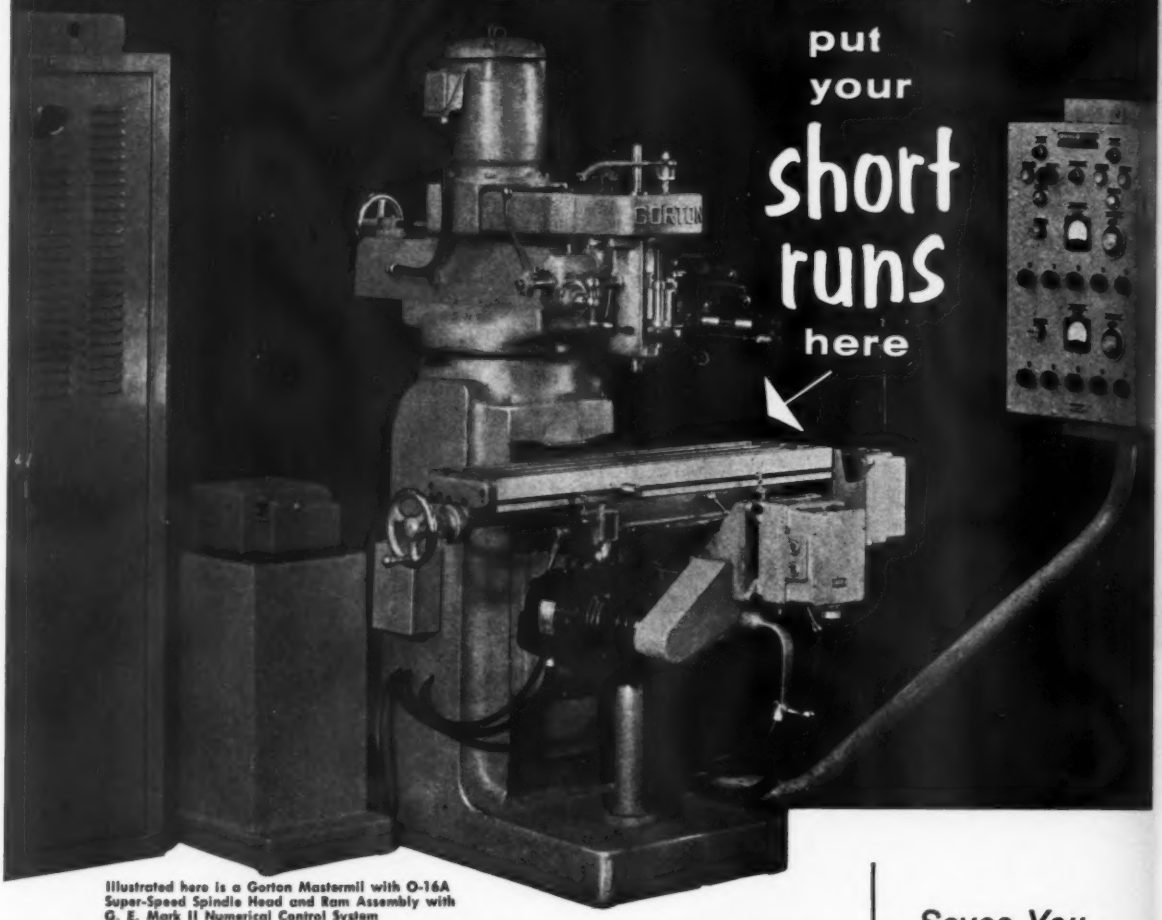

Illustrated here is a Gorton Mastermil with O-16A Super-Speed Spindle Head and Ram Assembly with G. E. Mark II Numerical Control System

GORTON NUMERICAL CONTROL

is field tested and proved in use

This is how Gorton Numerical Control saves you money on short runs:

- — eliminates elaborate and costly tools, dies, jigs and fixtures
- — wastes no time because operator does not "pace" the work
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- — change overs in set-ups can be made quickly
- — signals operator when tool changes are needed
- — guides cutter in close quarters without damage to work or cutter
- — making punched tape is simple typewriter operation

Punched tape . . . or magnetic tape control . . . is available to you on SIX standard Gorton machines and also on Gorton custom-designed machines. You'll be agreeably surprised when you learn the low cost of Gorton Numerical Control and how much more it gives you for your money. For full information write

Saves You Money on —

- face milling
- side milling
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Your letterhead inquiry will receive prompt attention.

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9	27	73	92	124	1125	1202	1291	1343	1412	1491
10	28	74	93	143	1131	1203	1292	1351	1413	1492
11	29	75	94	151	1132	1221	1293	1352	1421	1493
12	30	77	95	152	1133	1222	1294	1361	1422	1494
13	31	78	96	731	1134	1223	1295	1362	1423	1501
14	32	79	97	981	1151	1224	1301	1363	1451	1502
15	33	80	99	982	1152	1225	1302	1371	1452	1503
16	34	81	100	1071	1153	1226	1311	1372	1453	
17	36	82	101	1072	1154	1251	1312	1373	1454	
18	38	83	102	1073	1171	1252	1313	1381	1455	
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B4	C11	C29	C47	C65	P15	P33	P51	P69
B5	C12	C30	C48	C66	P16	P34	P52	P70
B6	C13	C31	C49	C67	P17	P35	P53	
B7	C14	C32	C50	C68	P18	P36	P54	
B8	C15	C33	C51	P1	P19	P37	P55	
B9	C16	C34	C52	P2	P20	P38	P56	
B10	C17	C35	C53	P3	P21	P39	P57	
B11	C18	C36	C54	P4	P22	P40	P58	
C1	C19	C37	C55	P5	P23	P41	P59	
C2	C20	C38	C56	P6	P24	P42	P60	
C3	C21	C39	C57	P7	P25	P43	P61	
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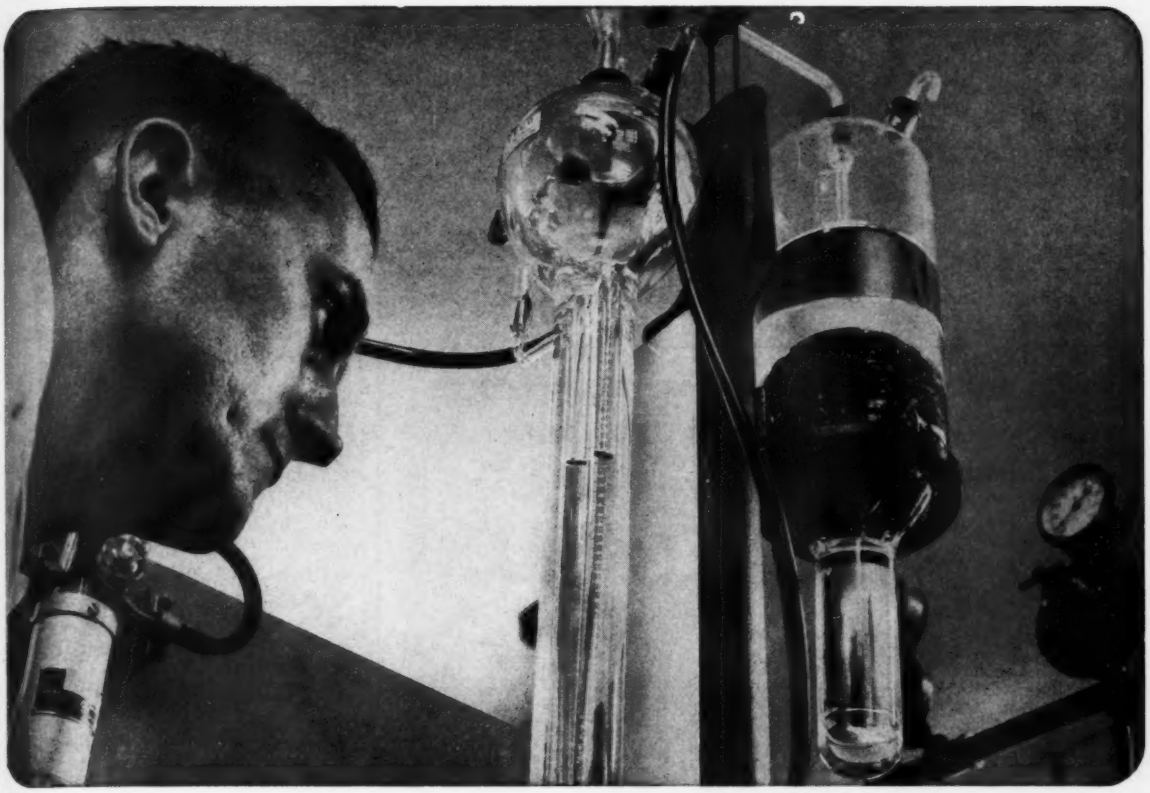

QUICK, FAST TESTING for carbon content is done not once or twice but 8 times per melt in A-L's Chem Lab with this direct reading Leco carbon determinator.

Carbon content checked 8 times during melt to guarantee A-L tool steel hardenability

Lab tests for carbon eliminate your guesswork; provide high hardness, uniform hardenability, reproducible tool performance.

Because carbon has the greatest influence on hardenability, Allegheny Ludlum watches it carefully during the melt. Testing a specimen for carbon takes only a few minutes. Therefore, A-L checks for carbon content 8 times during the melt, and makes the necessary adjustments to insure accurate control of carbon. This control means Allegheny Ludlum can hold carbon content to a closer range than most customers specify.

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This is just one of the many things A-L does to insure high quality. Here are some others: close control over forging techniques, rigid temperature-time programming, careful testing of billets prior to processing to insure good surface and sound interior, control over annealing to give you the right hardness for your exact machining operation, thorough metallurgical testing to insure top tool steel quality and meeting of your specifications.

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CIRCLE INFORM-A-GRAM KEY NO. 103

Catalogs . . .

New 12" Shapers with Universal Tables are described in a bulletin which explains and pictures features. Western Machine Tool Works, or Circle Inform-A-Gram No. C35.

A 64-Page Plastics Catalog and price list gives dimensions of sheets, rods, tubes, films, blocks, and flat tubings. Cadillac Plastic & Chemical Co., or Circle No. C36.

Machinery Replacement Practices are detailed in a 14-page brochure that tells when it is a good time to replace old machines. The Heald Machine Co., or Circle No. C37.

For All Manual Arc Welding Jobs use Idealarc TIG welders offered in Bulletin 4608.1. Construction details and applications are given. The Lincoln Electric Co., or Circle No. C38.

Light-Heavyweight Machine Tools are described in Catalog WT-50-9. Its 48-pages cover drill presses, grinders, cut-off machines, and band saws. Rockwell Mfg. Co., Walker-Turner Power Tool Div'n, or Circle No. C39.

Silicone Rubber used in plastic tooling and plastic model making is described in Bulletin CDS-191. Advantages and sequence of operations are shown. General Electric Co., or Circle No. C40.

Plastic Sheets, Rods, and tubes are listed and completely described in a 65-page catalog. Commercial Plastics and Supply Corp., or Circle Inform-A-Gram No. C41.

A Tempering Furnace's design and construction features are pointed out in Bulletin 5901-FL. Applications, schematic diagrams, and a typical strip chart are included. C. I. Hayes, Inc., or Circle No. C42.

Eyelet and Machine Catalog has 48-pages of eyelet design, development, and production and installation information. Different types of machines also discussed. United Shoe Machinery Corp., or No. C43.

The Hopkins Melting Process is explained in a brochure that tells advantages and includes tables of physical properties of the five melting techniques used by Firth Sterling Inc. to produce high purity metals. Write the company or Circle No. C44.

Angular Indexing to fraction of a second is explained in a bulletin about Ultradex indexing tables. Specifications and applications are

given for two models. Special adaptor plate for indexing in increments smaller than a full degree is described. Michigan Tool Co., or Circle No. C45.

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A Universal Toolmaker Microscope with 2.35" x 6" measuring range is described in a bulletin. Features are detailed and specifications listed. Opto-Metric, Inc., or Circle No. C46.

Over 1000 Cutting Tools are listed in a new Price Catalog No. 105, covering Illinite standard milling cutters and end mills. Tool & Instrument Div'n, Illinois Tool Works, or Circle No. C47.

Different Types of Torque Tools are listed in Bulletin 7705, which gives specifications for torque wrenches and screwdrivers. Apco Mossberg Co., or Circle No. C48.

A New Six Spindle Turret Drill is offered in a bulletin. The power indexing turret with 12 pre-selective spindle speeds and other features of Model 1C are described. Burg Tool Mfg. Co., Inc., or Circle Inform-A-Gram No. C49.

"Heat Treated Threading Heads," Bulletin F-90-4, features the JN Landex die head for automatic screw machines and chucking machines, and shows many other models in its 28-pages. Landis Machine Co., or Circle Inform-A-Gram No. C50.

De-Sta-Co Spacing Products are described in catalog inserts which give complete sizes and prices for machined collars and feeler stock in coils and strips. Detroit Stamping Co., or Circle No. C51.

"Flat Spring Steel" is a 28-page description booklet that includes consolidated conversion chart, weight calculation tables, and sheet metal gauge comparison tables. Athenia Steel Div'n, National-Standard Co., or Circle Inform-A-Gram No. C52.

New Single-Spindle Bar Automatic is presented in Bulletin B-359. Features, dimensions, and uses of Models B and B-18" are included. The Cleveland Automatic Machine Co., or Circle No. C53.

Precision Mechanical Finishing and automatic finishing processes are discussed in a 30-page catalog. Machines for doing various jobs are included. Roto-Finish Co., or Circle No. C54.

A Double Vertical Spindle Grinder is featured in a bulletin. Specifications and applications are given for this and other models. Gardner Machine Co., or Circle Inform-A-Gram No. C55.

For Joining Cemented Carbide to steel use Plymet, a new bonding material discussed in a brochure. Procedure is described. Powder Alloys Corp., or Circle No. C56.

Industrial Limit Switches are discussed in a booklet which gives suggestions for their proper application. Micro Switch, a Div'n, Minneapolis-Honeywell Regulator Co., or Circle No. C57.

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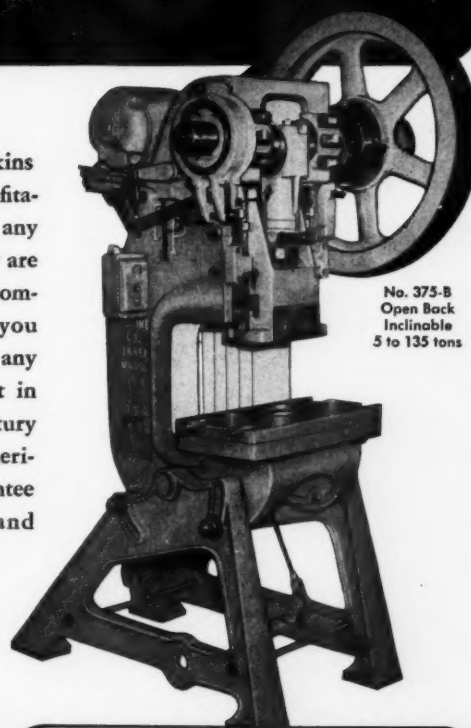

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CIRCLE INFORM-A-GRAM KEY NO. 105

Catalogs . . .

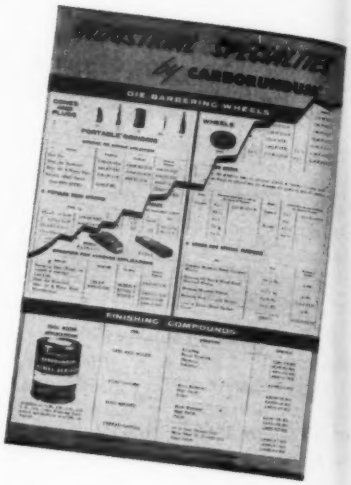
Small Parts Vibrating Feeder is featured in a bulletin which also describes pneumatic impact tool and low cost drill unit. Burklyn Co., or Circle Inform-A-Gram No. C58.

A New Welding Carbon Products Manual describes uses and shows how carbon plate rod and paste eliminate jigs and fixtures, especially on small jobs. Arcair Co., or Circle Inform-A-Gram No. C59.

Select Copper, Brass, and Bronze Alloys from a new bulletin which gives applications, physical and mechanical properties, and specifications. Bridgeport Brass Co., or Circle Inform-A-Gram No. C60.

"The Conical Keystone Lock Blind Rivet," Brochure 8-388, shows their use as high-strength structural fasteners, and gives strength and material data, features, and uses. Huck Mfg. Co., or Circle No. C61.

A Full Scale Drafting Template Set for jig and fixture and special machinery designers and manufacturers includes over 200 components. Northwestern Tools, Inc., or Circle Inform-A-Gram No. C62.



Grinding and Finishing Tools and compounds are listed in a long chart that pin-points types and sizes and suggested uses. The Carborundum Co., or Circle No. C63.

"To Speed Up Operations" shows how Wassell Produc-Trol, the peg-and-tape control system, speeds design and production of Army missiles. Wassell Organization, Inc., or Circle Inform-A-Gram No. C64.

End Mills featuring eccentric radial relief, continuous flow, and curve fluting are introduced in Bulletin 628. Sizes and recommended use for Type G are given. Pratt & Whitney Co., Inc., or Circle Inform-A-Gram No. C65.

Extruded Rectangles for wear and abrasion applications have been announced in a bulletin which contains stock sizes, weights, typical physical properties, and specifications. Ampco Metal Inc., or Circle Inform-A-Gram No. C66.

Tungsten Carbide Tools, tool tips, dies, wear parts, and Dex-A-Tools are described in a 32-page Catalog 359 from Adamas Carbide Corp. Circle Inform-A-Gram No. C67.

A Tough, Hard, Chemical Resistant Resin used for molded parts, extrusions, and formable sheet is described in a bulletin. Cycolac's recommended usage, properties, and advantages are included. Marbon Chemical, Div'n of Borg Warner Corp., or Circle Inform-A-Gram No. C68.

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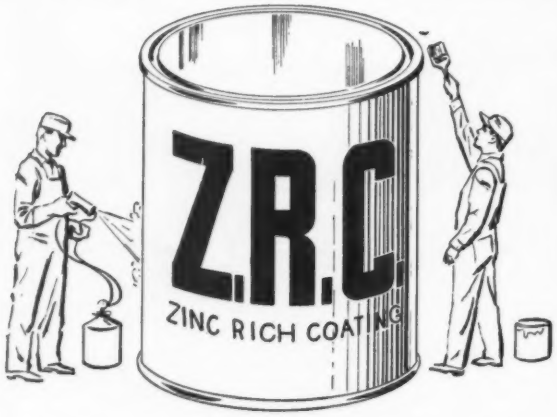

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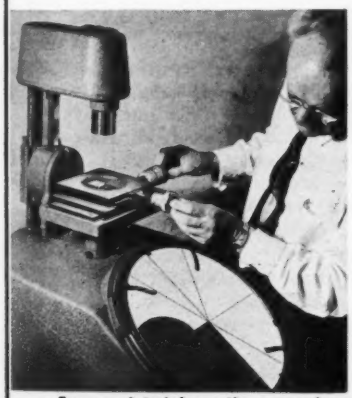

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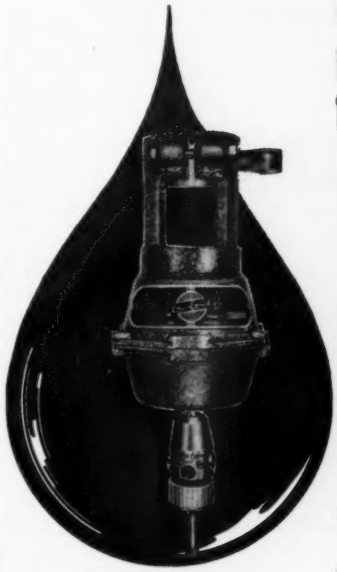

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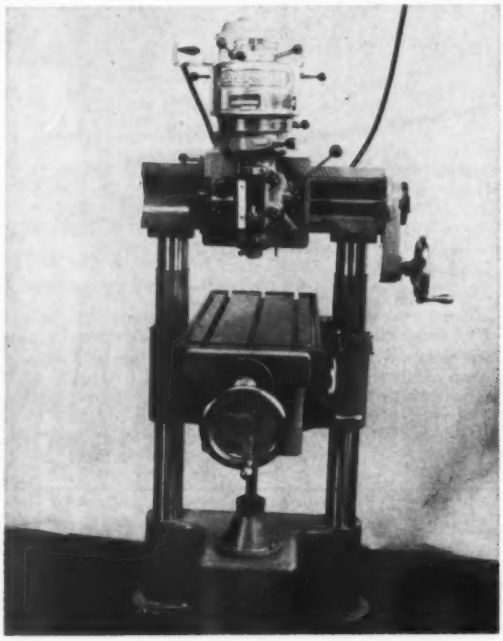

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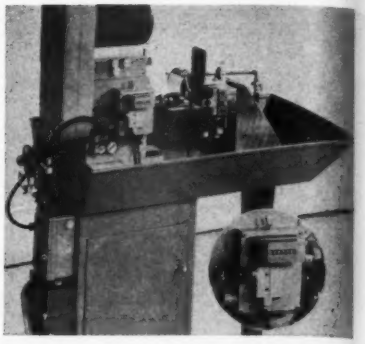

precision manufacturing operations. Durant Mfg. Co., 1974 N. Buffum St., Milwaukee 1, or Circle Inform-A-Gram No. P4.

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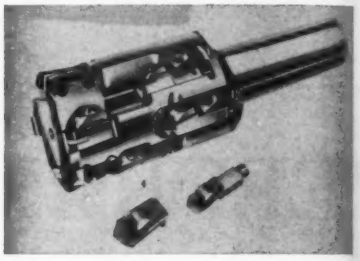

nounced by Valenite Metals, Box 205, Royal Oak, Mich. The V.B.U. system of tooling makes it possible to maintain tools at the machine site to eliminate toolroom grinding, sharpening, and adjustments. For details, write the company, or Circle Inform-A-Gram No. P5.

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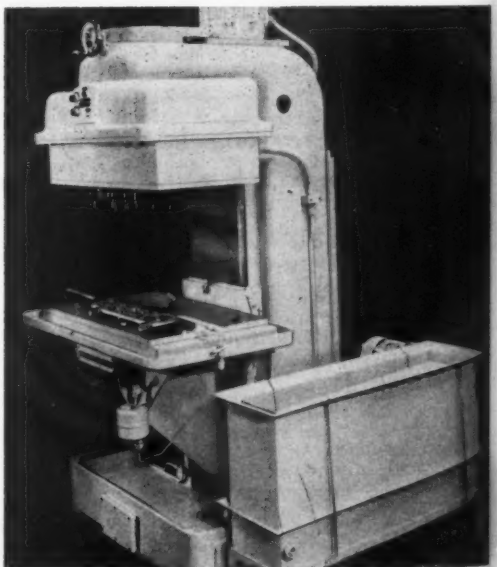

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The job engineered drill point and Ford flute form minimize friction by cutting chips. Actual tests have proved that up to 100 holes were drilled in hardened steel before the Hi-Roc showed signs of dulling.

For salvage and production drilling, Hi-Roc drills produce accurate sized holes within .0002 of drill size . . . and Hi-Roc drills *last*.

Available through all FORD Industrial Distributors.

Rotary FORD Tools

Write for bulletin 806 — Address Dept. TP-959

M. A. FORD MFG. CO., INC.
1545 Rockingham Rd., Davenport, Iowa

Precision Manufacturer of
H.S.S. and Carbide Rotary Cutters • Carbide End Mills • Special Tools

CIRCLE INFORM-A-GRAM KEY NO. 1113

DRILL THESE HOLES
BY A QUICK, EASY, INEXPENSIVE METHOD
Your business letterhead will bring literature.
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HOLES

PRECISION HOLE FINISHING WITH FLOATING CUTTER
Clark "FINISHING BARS"
P. O. BOX 990 BEVERLY HILLS, CALIF.

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Large Precision Machining
Done to your specifications
We Have
22 Jig Borers
KIDDE PRECISION TOOL CORPORATION
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FREE . . . YOUR COPY OF THE NEW ALDEN SYSTEMS HANDBOOK

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Chas Eisler Jr. Pres
EISLER ENGINEERING CO., INC.

CIRCLE INFORM-A-GRAM KEY NO. 1125

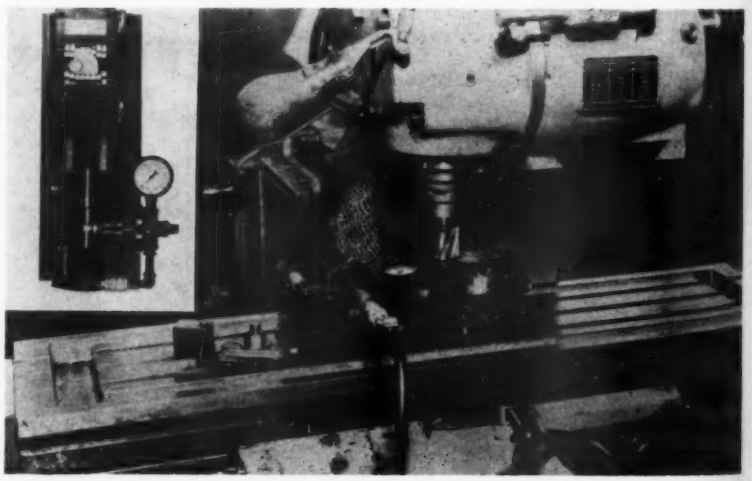
Product News

For Discharge Machining

Greater cutting current at the work is now possible with the new and improved circuits that power and feed electrical discharge machining equipment. More informative control panel and unit-type construction for simple maintenance are other features. Literature is available from The Matson Co., 8774 Grinnell, Detroit 13, or Circle Inform-A-Gram No. P7.

Pencil Grinder

Here's a small sized grinder for small carbide cutters, burrs, mounted points and drills. Die touch up work, pattern work, or any job that needs precision control with a reserve of power for metal removal can be handled easily by Model M1223, D-03. The Rotor Tool Co., 26300 Lakeland Blvd., Cleveland 32, or Circle Inform-A-Gram No. P8.



Holding Device Features Power Actuation

The contour grip holding fixture can now be actuated pneumatically, hydraulically, or through solenoid valves and synchronized with any machine tool operation. It'll hold any odd shape and is good for both short and long production runs. E. W. Bliss Co., Die Supply Div'n, 1400 Brookpark Rd., Cleveland, or Circle Inform-A-Gram No. P9.

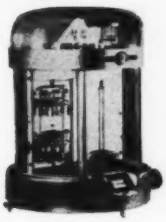
VARIMEX Ltd.

POLISH COMPANY FOR FOREIGN TRADE

Wilcza 50/52, Warsaw, Poland

CABLE: Varimex Warsaw

Sole Exporters of:



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FOR INFORMATION CONTACT:

COMMERCIAL COUNSELOR
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2125 Leroy Place, N.W.,
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CIRCLE INFORM-A-GRAM KEY NO. 1131

Danny DoALL says:

"Did you know that Demon® HIGH-SPEED STEEL Saw Bands cut 10 times faster and last 30 times longer than carbon?"

Call your local DoALL STORE to learn how to improve your band sawing operations as much as 650% with greater accuracy, speed and finish . . . see demonstration!

THE DoALL COMPANY
DES PLAINES, ILLINOIS

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BURR-BIT CUTS TAPPING COST WAY-DOWN!

Just lock Burr-Bit on any make tap and holes are deburred automatically, leaving a smooth clean chamfer. ONE OPERATION, ONE SETUP. ONE HANDLING.

NEW ADDITION
Now Burr-Bit fits 3 fluted taps from #6 to ½". Also available to fit any tap 2 or 4 fluted from #2 to ¾"

A quality product made of the finest high speed tool steel for use on almost every material.

WRITE now for complete data and reports from engineers who have adapted Burr-Bit and saved on their tapping operations.
INVESTIGATE Burr-Bit-today.

VERNON DEVICES, Inc.
481 E. 3rd Street Mt. Vernon, N.Y. MOunt Vernon 4-1686

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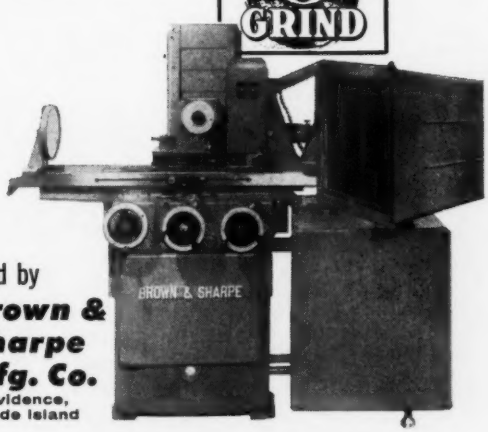
SAVE 50%
or more in
CONTOUR GRINDING
COSTS with VISUAL GRIND



Sold by
Brown & Sharpe Mfg. Co.
Providence, Rhode Island

Visual Grind is manufactured by
The CLEVELAND GRINDING MACHINE Co.
1730 EDDY ROAD • CLEVELAND 12, OHIO

CIRCLE INFORM-A-GRAM KEY NO. 1134

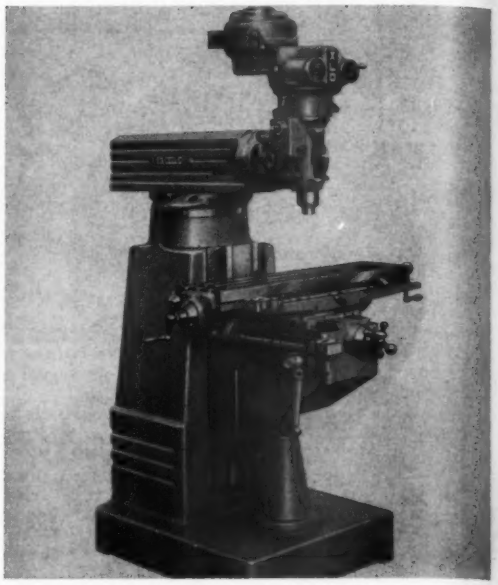
Product News

Adjustable Boring Bar

A New Boring Bar Holder offers a unique split eccentric bushing that easily rotates to facilitate boring bar height and center adjustment. Quadrabar receives 3/8", 1/2", 3/4", and 1¼" dia boring bars and needs no special adaptors or bushings to fit engine lathes with 8" to 18" swings. The Dunham Tool Co., Inc., RD 4, Danbury, Conn., supplies a bulletin, or Circle Inform-A-Gram No. P10.

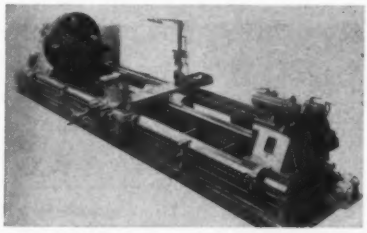
Money Saving Mill

Set spindle speeds by the turn of a dial and eliminate changing belts to get approximate speed on this new ram turret mill. The head pivots parallel and at right angles to the work, and power feed provides three speeds available in both directions. Write for details to Ex-Cell-O Corp. of Canada, Ltd., or Circle No. P11.



Handles Large Work

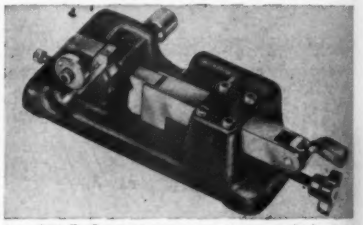
The New Space-Master Lathe Line is available with up to 72" swing and 50' center distance, for precision turning large work. Features 16-spindle-speed headstock with lapped herringbone gears, to provide smoother operation, greater tooth contact, balanced gear loads, and



longer gear life. The Sydney Machine Tool Co., Sidney, Ohio, or Circle Inform-A-Gram No. P12.

Simple Drill Fixture

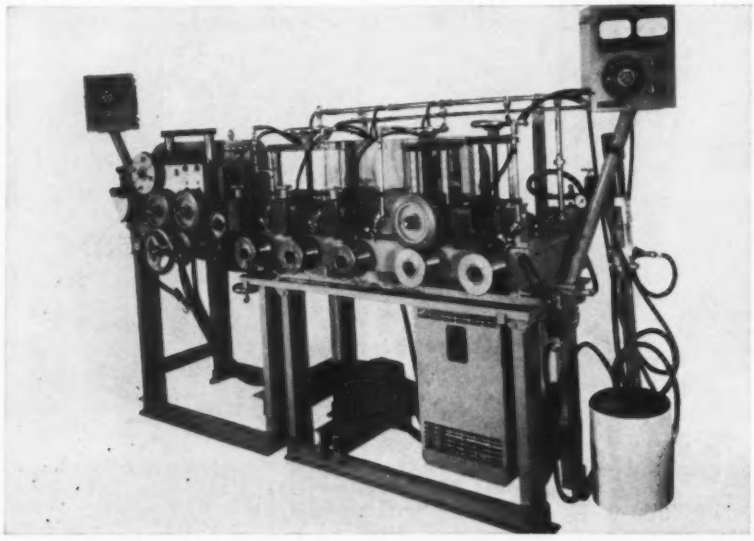
A Safety-Wire Adjustable Drill Fixture is the first of a series to standardize many otherwise difficult and drilling operations. Model SW-15 is a holding fixture for 1/4"



to 1½" hexagons, nuts, and bolts. Eliminates expensive tool-up waiting periods and is used for short and long runs. Ace Drill Bushing Co., Inc., 5407 Fountain Ave., Los Angeles 29, supplies Catalog D-11, or Circle Inform-A-Gram No. P14.

Pre-Marking Conditioner

For cleaning surfaces for printing moving bar and tubing stock, here's a surface-conditioner. The unit's adjustable for ¼" to 6" tubing and 125 to 1000 fpm marking speeds. Jas. H. Matthews & Co., 3962 Forbes Ave., Pittsburgh 13, or Circle Inform-A-Gram No. P13.



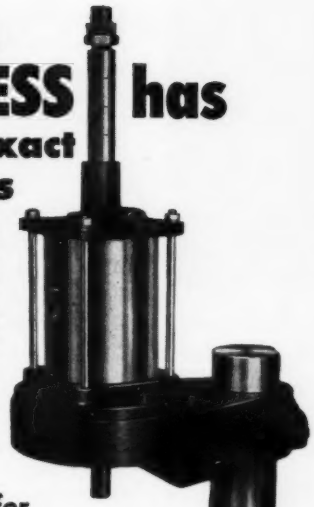
Easier Dressing

This new type wheel dresser, Spin-Kontrol, has a free-spinning wheel which offers exceptional dressing ease, versatility, and control. Very good for use on diamond wheels. Jarvis Corp., Middletown, Conn., or Circle No. P15.

This AIR PRESS has positive, exact depth stops

Many job changes can be made by quick, simple stop nuts, without touching column adjustment. Rigid, solid steel column, and heavy surface-ground base.

One of nine sizes and models in the great dependable Mead Air Press line.



Write for complete information!

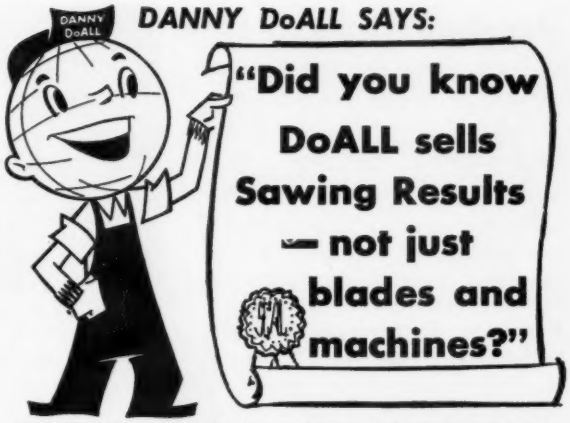
MEAD SPECIALTIES COMPANY

PATHFINDER IN AIR POWER AUTOMATION

4114 N. Knox Ave. Dept. HA-99 Chicago 41, Ill.

CIRCLE INFORM-A-GRAM KEY NO. 1151

DANNY DoALL SAYS:



Only DoALL makes both machines and blades. That's why your DoALL Sawing Specialist knows best how to make them work together as a perfect team to give you top efficiency in your band sawing.

SB-74¼

IN STOCK AT YOUR LOCAL DoALL STORE

THE DoALL COMPANY
DES PLAINES, ILLINOIS

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Prompt Service on RAYMOND Chrome Vanadium

DIE SPRINGS

Stock or Special Sizes

Medium, Medium-Heavy, Heavy Duty

Distributed by leading die set manufacturers

5833

Wide variety of hole and rod sizes, lengths, deflections. Increased fatigue life. Reduced down time. *Write for specifications and price list, and name of nearest distributor.*

Raymond Manufacturing Division

Associated Spring Corporation

Corry, Pennsylvania

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complete protection against dirt, grime and wear for any moving part with

ELASTICONE® COVERS

Plan ahead . . . specify Elasticones by size and number on your next drawing—get automatic protection for shafts, bushings, lead screws, guide pins or hydraulic rams—wherever precision and lubrication must be preserved.

Elasticones are spirally wound flat alloy steel cones available* in standard sizes for immediate delivery. Write for complete information and new data sheet '58.

CENTRAL Safety Equipment Co.

6603 Marsden Street Philadelphia 35, Pa.

Distributors in principal cities

CIRCLE INFORM-A-GRAM KEY NO. 1154

Product News

Does Contour Turning

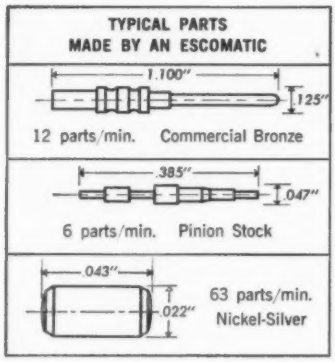
Conversion of Vertical Turret Lathes for contour turning within extremely close tolerances can be done with electronic-hydraulic Duplimatic tracer control attachments. Hemispherical or irregularly shaped surfaces can be contoured inside and out automatically. Permits tolerances

of ±0.005″ at 25 ipm, and ±0.0005″ at speeds to 5 ipm. Tracer Control Co., 595 E. Ten Mile Rd., Hazel Park, Mich., or Circle P16.

Produce Small Parts Faster At Lower Cost With An *Escomatic*

View of uncovered Esco DS 2 with wire straightening attachment.

Feed from Coil or Bar Stock



Up to 100 precision parts per minute are possible on the Esco DS 2, a Swiss form-turning and cut-off machine. Stock, fed from coils or bars of any length, is machined by two **revolving** cutting tools mounted in a cam controlled tool head. Resulting parts are clean, accurate and **entirely burr-free**—and are delivered separate from the chips. Coil feed provides efficiency up to 95%, eliminates bar ends, speeds production.

- **Capacity** Up to 5/32″ dia. x 3¾″ length
- **Accuracy** As close as ±.00025″
- **Finish** As fine as 8 micro-inches

Write For Additional Information

COSA — *nationwide sales and service of precision machine tools—from bench lathes to boring mills.*

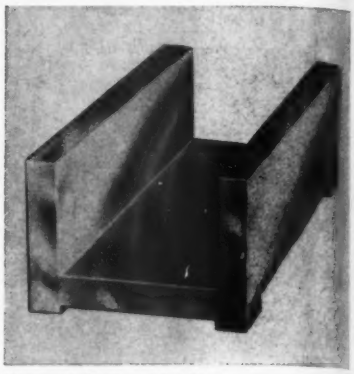
COSA CORPORATION, 405 LEXINGTON AVENUE, NEW YORK 17, N.Y.

IN CANADA contact COSA CORP. OF CANADA, LTD., 1160 Lakeshore Road, Long Branch, Toronto 14, Ont.

CIRCLE INFORM-A-GRAM KEY NO. 116

Save 50% Design Time

Aluminum and cast iron standard



jig and fixture bodies now come in 65,000 sizes. They'll cut design and toolroom time in half and can be used for drill jigs, milling fixtures, and other tooling applications. Smith Engineering & Tool Co., 193 Bay Ave., Glen Ridge, N. J., or Circle Inform-A-Gram No. P17.

Etch-Resisting Coating

A new light sensitive, etch-resisting plastic coating material is used in chemical milling to remove steel, aluminum, titanium, magnesium, and other metals. Metal-Etch Resist is recommended for small parts manufacture and weight reduction work. Eastman Kodak, Co., Rochester 4, N. Y., or Circle No. P18.

Rust Preventive

For protection against rust in applications where spraying is advantageous and where drying or removal

of moisture is costly, use Rust-Lick 606. It has fog-maker for easy use. Bulletin 62 gives details. Rust-Lick, Inc., 755 Boylston St., Boston 16, or Circle No. P19.

PRECISION CHAMPION ®

NEW

short sleeve expanding mandrel

Champion precision expanding mandrels are now available with short sleeves which save 25% to 35% of your cost. Precision of .0002" T.I.R. in all sizes is guaranteed with 100% inspection before shipment. Standard sizes are available from 5/32" to 9½" O.D. All mandrels have several sleeve sizes to fit each arbor for greater economy. We have the mandrel that fits your requirements exactly—and we can supply most sizes from stock today.

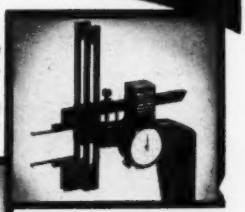
Send for free catalog giving complete line, specifications and prices

THE WESTERN TOOL & MANUFACTURING CO., INC.
SPRINGFIELD, OHIO FAIRFAX 3-9151

CIRCLE INFORM-A-GRAM KEY NO. 1171

New *Fast Acting* gage speeds precision measurement of grooves and bores!

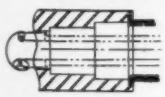
Direct Reading with .0005" (or .0001") dial. Complete line with interchangeable tips measures from .230" to 10" I.D. Depth of Bore up to 10".
Maximum Repeating Precision: spring set to gaging position. Hand pressure used only to release gage.



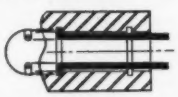
Groove Gage Model 1900 Series

Deep Bore Gage Model 1930 Series

Fast: interchangeable tips changed in seconds. No special training required to make fast, accurate measurements, both O.D. and I.D.



Gaging Bores and Counterbores — 2 and 3 point measuring. Min-Max bore range .187"-10".



Gaging Grooves.— 2 or 3 points may be used for O-Ring, Truarc and Snap Ring Grooves.

Gaging O.D. Grooves — Unparalleled accuracy and speed. Fast tip change also gives groove concentricity.

Dealers: Some territories available for Mueller's line of time-saving gages. Write for information.

Ask your dealer for information on Mueller Gages. Informative bulletins fully describe operation and typical applications. Write today.

MUELLER GAGES COMPANY

A DIVISION OF MUELLER LABORATORY
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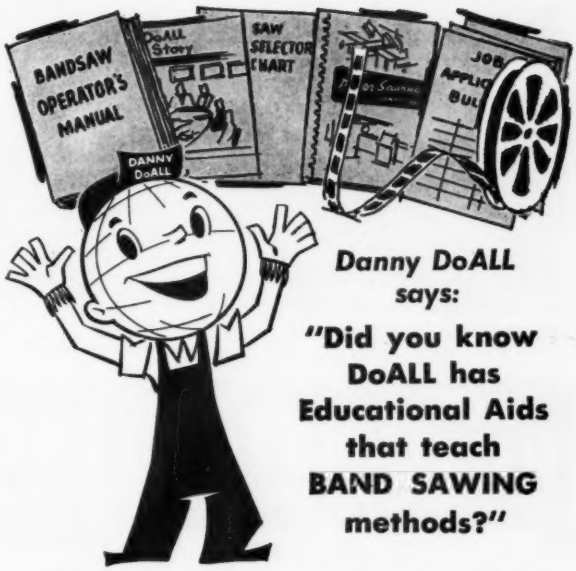

Danny DoALL says:

"Did you know DoALL has Educational Aids that teach BAND SAWING methods?"

Textbooks! Training manuals! Tool selector wall charts! Job-spotting bulletin service! Educational movies and many other informative aids are furnished *free!* Call your local DoALL store.

SB-75¼

Find Your DoALL STORE In The "Yellow Pages"

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NEW 1959 EDITION

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One Complete Source of Detailed Specifications for Designers, Production Managers, Toolroom Foremen

Hundreds of NEW ITEMS

ALL NEW — Complete specifications and cost saving data on over 2000 "Standards", including world's largest line of workholding equipment, chuck jaw blanks, handles, knobs, wheels, strap clamp assemblies, forged items, plus hundreds of other jig and fixture components. Detailed specifications, engineering drawings. The one complete source for data on all the "standards" for tool, die, jig, and fixture design and application.

Write for your FREE copy today.

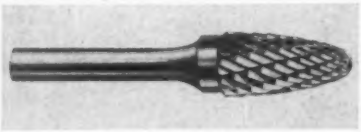
JERGENS TOOL SPECIALTY CO.

Dept. TP-9, 712 E. 163rd St., Cleveland 10, Ohio

CIRCLE INFORM-A-GRAM KEY NO. 1174

Product News

Clean Up Welds

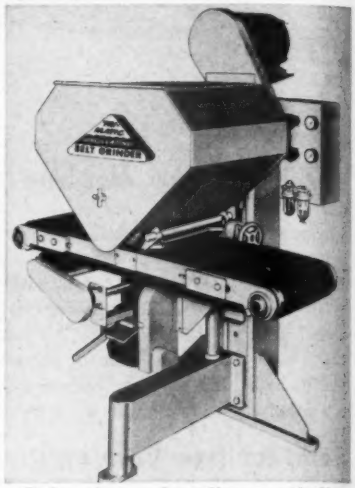


A new alternate diamond pattern design with coarse cut grind gives this new carbide cutter fast, efficient cutting action and doesn't produce splinters. It penetrates materials faster, removes more stock, doesn't chip out, and has up to 300% more life. M. A. Ford Mfg. Co., Inc., Davenport, Iowa, or Circle No. P20.

Stencil Markers

Copper marks are electrolytically deposited on ferrous markers announced by The Lectroetch Co., 14925 Elderwood Ave., E. Cleveland 12. About 0.00003" of copper is deposited on the part in three to five seconds. Get more information from the company, or Circle Inform-A-Gram No. P21.

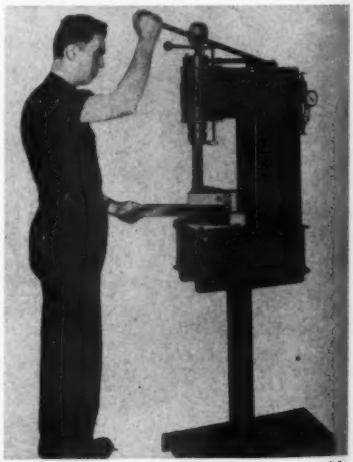
Speedy Belt Grinder



Deburring, descaling, grinding, and polishing are handled by the new Tri-Matic oscillating belt grinder. Controlled oscillation of the abrasive belt through positive steering without stretching provides faster cutting, less loading, and longer belt life. Sales Service Mfg. Co., 2363 University Ave., St. Paul 14, Minn., or Circle No. P22.

Versatile Arbor Press

Featuring an air-actuated, fast ram approach, a new 10-ton hand-operated hydraulic bench arbor press is equipped for utmost speed

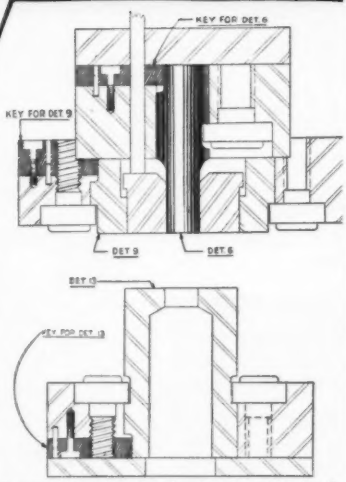


and ease of operation. It's adaptable for bending, straightening, forming, and punching at more than 20 spm. Bulletin 104-AO supplied by K. R. Wilson, Inc., Arcade, N. Y., or Circle No. P23.

NEW
HOVIS KEY-ALIGNED DIE
THE LATEST ADDITION TO OUR STANDARD UNITS
a must for irregular stampings

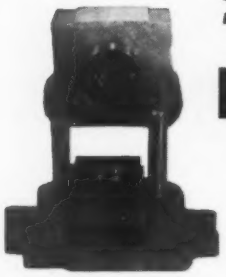
ELIMINATES ALL SET-UP ERRORS AND INSURES UNINTERRUPTED ACCURACY

When producing irregular shaped stampings, it is important that the cutting members of the die are located in the proper radial alignment. Hovis has introduced the key-aligned die to meet this requirement . . . With the key-aligned die any press operator can install the inserts without the possibility of misalignment. This is accomplished with a flat on the insert which locates against a key in the retainer.



A section line drawing showing the principle of the Hovis key-align method.

An example of some irregular pieces these dies produce by merely purchasing special sets of parts on which we are glad to quote



Made in 6 sizes:
¾"-1½"-2½"-4"-6"-8"

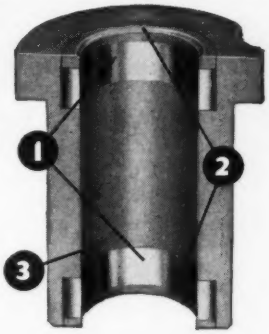
HOVIS UNIVERSAL COMPOUND DIES
for producing WASHERS and SMALL STAMPINGS . . . No need to make a NEW DIE for every STAMPED PART
By simply removing and replacing five, small, interchangeable inserts a new part may be produced . . . This method makes possible all production including irregularly shaped pieces and shallow draws.

HOVIS SCREWLOCK COMPANY
8100 E. NINE MILE ROAD • BOX 97 • WARREN, MICHIGAN
Phone: Slocum 7-4800 Suburb of Detroit

CIRCLE INFORM-A-GRAM KEY NO. 118

CARBIDE INSERTED MEYCO BUSHINGS Can Cut Production Costs!

MEYCO carbide inserted drill jig bushings have been successfully saving money on production runs for the past decade. Performance: same as solid carbide, but need not be handled with kid gloves. Greater economy, because of long life at less cost. You can enjoy the advantages of greater accuracy for a longer time, less spoilage, less machine down-time, added drill and jig life with MEYCO carbide inserted drill jig bushings. Get the full story now: write for new Bushing Catalog No. 41



*PATENTED

1. Tungsten carbide rings at the points of wear; 2. Steel rings protect drills and carbide; 3. Special hardened alloy steel body.

W. F. MEYERS CO., INC., BEDFORD, IND.

CIRCLE INFORM-A-GRAM KEY NO. 1191

Presenting Industry's

BIG SHOW OF SUPER PRECISION SPINDLES

The Complete Line ★ The Diversified Line ★ Job Tested ★ Job Proven

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CINCINNATI

THE CINCINNATI ELECTRICAL TOOL CO.
338 Mt. Hope Avenue Cincinnati 4, Ohio

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Danny DoALL says:

"Do you know that DoALL's Sawing Research Laboratory will help you solve unusual band-sawing problems?"

SB-76¼

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Problem materials? Difficult cuts? High costs? Get the answers FREE! Call your local DoALL store.

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Decimal Reamer Catalog!

The world's greatest Reamer

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BY STYLES • DIMENSIONS
RANGES • SELECTIBILITY
STOCK ITEMS • NET PRICES

BUY SUPEREAM — The reamer that is sold and stocked in more sizes than any other reamer in the whole world.

TWENTIETH CENTURY MFG. CO., Box 429T, Libertyville, Illinois
GENTLEMEN: Send us the NEW SELECTIVE CATALOG No. 10A.

NAME _____ Firm _____

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For world's greatest selection of REAMERS!

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NEW DI-ACRO 24-INCH BOX FINGER BRAKE

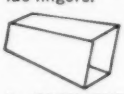
UNDERCUT FINGERS and one inch clearance permit forming chassis with up to ½-inch flange and clearing reverse bends from front of machine. New Quik-Set Micrometer Gauge instantly positions material for forming to die accuracy. This new 24-inch brake is designed for use in experimental labs, model shops and on short-run production.

Look for the name of your nearest Di-Acro distributor in the Yellow Pages under Machinery, Machine Tools . . . or write to O'Neil-Irwin Mfg. Co., for the fully illustrated folder.

1. BOX AND CABINET FORMER . . . forms all widths from ¾" to 24" by ¼" steps.

2. BAR FOLDER . . . folds or hems up to 16 gauge mild sheet steel across full width.

3. RADIUS FORMER . . . forms radii by positioning forming edge or with special radius fingers.



4. OPEN END FORMER . . . forms open end shapes by replacing box fingers with open end finger.

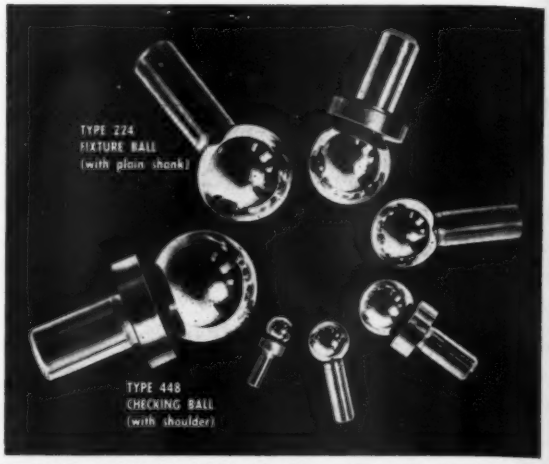
Find Us Fast in The Yellow Pages

Pronounced die-ack-ro

di-acro PRECISION METALWORKING MACHINES

O'NEIL-IRWIN MFG. CO.
315 Eighth Avenue
Lake City, Minnesota

CIRCLE INFORM-A-GRAM KEY NO. 1201



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- Durable; corrosion-resistant. Made of Type 440-C stainless steel, hardened to 55-58 Rockwell C.
- Highly accurate. Ball size held to ±.0001" for fixture balls; ±.00002" for checking balls.
- In stock: Types 224 and 448 in 7 ball sizes, ¼" to 1" by ¼" steps; Type 348, with ½" ball and shouldered shank tapped 6-32. Other sizes to order.

WRITE FOR price list and ASTE Data Sheet

INDUSTRIAL TECTONICS, Inc.
ITI
MANUFACTURERS OF PRECISION BALLS AND BEARINGS
3693 JACKSON ROAD
ANN ARBOR, MICHIGAN

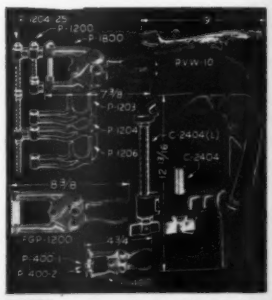
CIRCLE INFORM-A-GRAM KEY NO. 1202

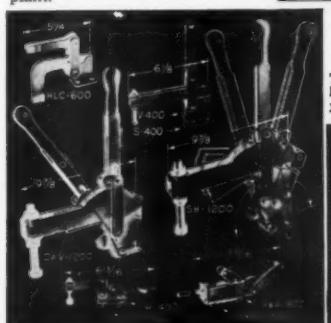
THERE ARE *KNU-VISE* PRODUCTS TO MEET YOUR EVERY CLAMPING NEED

(OVER 150 MODELS)

LAPEER devices are the choice of leading manufacturers for all operations requiring fast and reliable clamping.

Recognized as clamping engineers we can give you much valuable assistance. We will gladly discuss your clamping problem at your plant.





UNMATCHED FOR RUGGED USE, DEPENDABILITY, SPEED AND LONG SERVICE

They were developed through exhaustive tests in laboratory and years of practical use.

LAPEER MANUFACTURING CO.
3064 DAVISON ROAD, LAPEER, MICH.

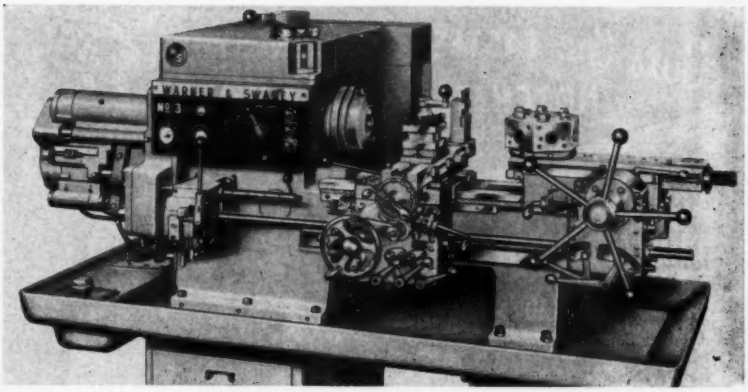
Manufacturers of over 150 models of manually and air-operated clamps and pliers.

WESTERN DIV.: PECK and LEWIS CORP. 4436 Long Beach Ave., Los Angeles 58, Calif.
CANADIAN DIV.: HIGGINSON EQUIP. SALES, 1131 Pettit Road, Burlington, Ontario

CIRCLE INFORM-A-GRAM KEY NO. 1203

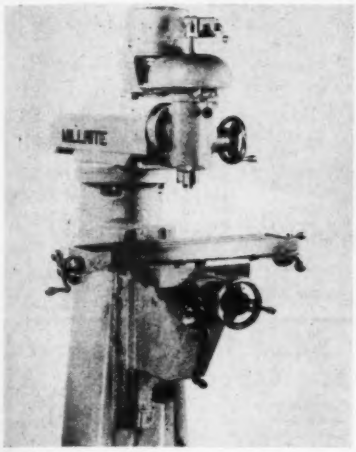
Eight Speed Headstock & Preselector on New Lathe

A new No. 3 universal turret lathe features an eight-speed, all-hydraulic clutch headstock plus a single lever speed preselection and change control. It handles up to 1½" dia bar work. The direct reading preselector dial tells exact surface speed for each diameter and rpm. The Warner & Swasey Co., 5701 Carnegie Ave., Cleveland 3, or Circle Inform-A-Gram No. P24.



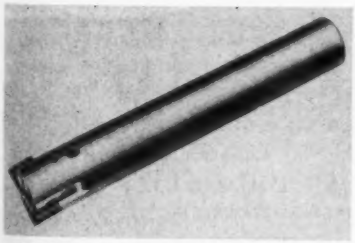
Large Capacity Mill

A new vertical toolroom milling machine, with range and capacity of larger mills, is for precision milling and boring. A feature of this low cost unit is the Feather Feed of the

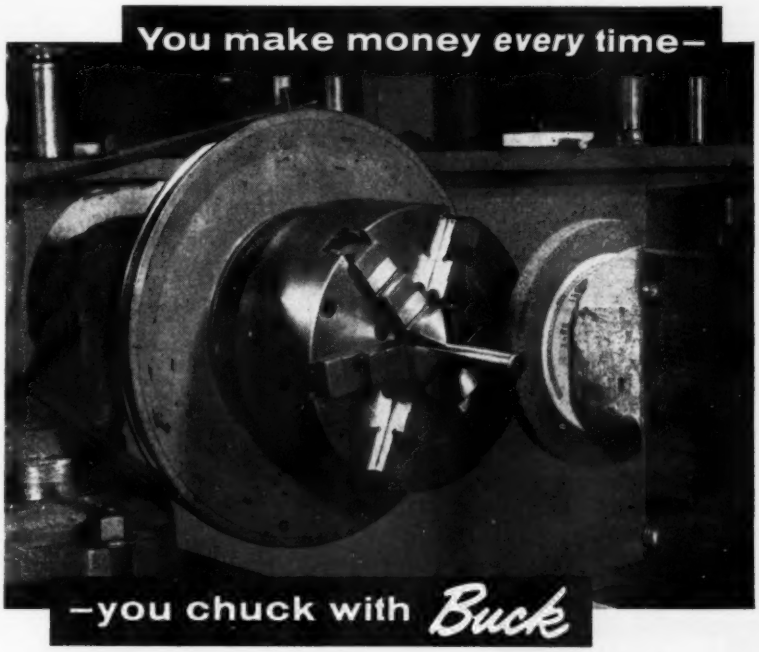


quill that utilizes the inherent accuracy and smoothness of a lead screw and nut arrangement. Has 7" x 27" table with 16" longitudinal feed. The U. S. Burke Machine Tool Div'n, Brotherton Rd. at Pennsylvania R.R., Cincinnati 27, or Circle No. P25.

Bottoming Bar



Finish walls and bottoms of holes to close tolerances with excellent finishes with this new bottoming bar. It's not for full bottoming but it squares off internal shoulders and cleans up bottoms to within a small dimension of the center. Robert H. Clark Co., 9330 Santa Monica Blvd., Beverly Hills, Calif., or Circle P26.



Here's why:

You can *always* secure *dead* true precision on single parts—and machine within .0005" on duplicate parts without chuck adjustment. (Compare that with conventional chucks that are only accurate to .003" *when new.*)

You save costly machinists' time each chucking. Takes but a minute to indicate and adjust a Buck. No shims needed. Even inexperienced operators can do precision work thanks to the exclusive Buck Ajust-Tru® features.

Buck chucks give you more precise work with new machine tools, or compensate for spindle run-out to prolong old machine usefulness. And the Ajust-Tru operating principle takes up normal internal chuck wear.

You get all those Buck *plus features* at no additional cost. Send for catalog—see why "It pays to chuck with Buck" today.

Makers of Scroll, Power, Dust Proof, Independent Chucks.

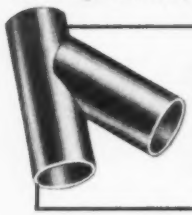
BUCK TOOL COMPANY
918 SCHIPPERS LANE • KALAMAZOO, MICHIGAN
CIRCLE INFORM-A-GRAM KEY NO. 121

Cuts the FASTEST and FINEST NOTCHES Ever Made!

ARC-SNUG

ARC-SNUG gives you clean-edge, close-fitting, true contour notching by making both the first and second cuts of the notch in a single downstroke of the press. Notches ½" to 1¼" O.D. metal tubing (16 gauge and under) at angles ranging from 35 to 90 degrees. Special sizes and special dies to cut stainless steel, Monel metal, etc., made to order. Dies for various angles and sizes are interchangeable. Write for literature.

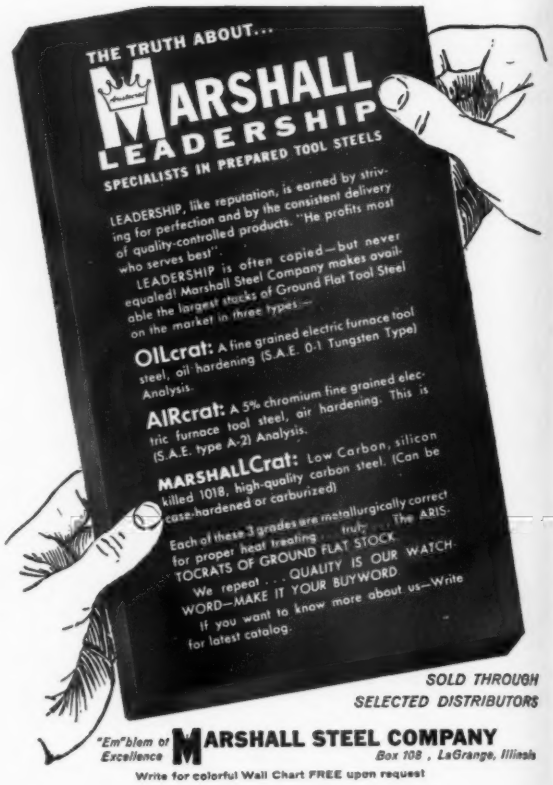
NOTCHED SAMPLES GLADLY FURNISHED



Combines 2 operations in one... to give you the snuggest fitting, angular tubing joints for cheaper, quicker, easier induction welding or brazing.

VOGEL TOOL & DIE CORPORATION
1813 NORTH 32nd AVENUE • MELROSE PARK, ILLINOIS

CIRCLE INFORM-A-GRAM KEY NO. 1221


THE TRUTH ABOUT...
MARSHALL
LEADERSHIP
SPECIALISTS IN PREPARED TOOL STEELS
LEADERSHIP, like reputation, is earned by striving for perfection and by the consistent delivery of quality-controlled products. "He profits most who serves best".
LEADERSHIP is often copied—but never equaled! Marshall Steel Company makes available the largest stocks of Ground Flat Tool Steel on the market in three types—
OILcrat: A fine grained electric furnace tool steel, oil hardening (S.A.E. O-1 Tungsten Type) Analysis.
AIRcrat: A 5% chromium fine grained electric furnace tool steel, air hardening. This is (S.A.E. type A-2) Analysis.
MARSHALLCrat: Low Carbon, silicon killed 1018, high-quality carbon steel. (Can be case-hardened or carburized)
Each of these 3 grades are metallurgically correct for proper heat treating . . . truly. The ARISTOCRATS OF GROUND FLAT STOCK.
We repeat . . . QUALITY IS OUR WATCH-WORD—MAKE IT YOUR BUYWORD
If you want to know more about us—Write for latest catalog.

SOLD THROUGH SELECTED DISTRIBUTORS

"Em"blem of Excellence MARSHALL STEEL COMPANY
Box 108, LaGrange, Illinois

Write for colorful Wall Chart FREE upon request

CIRCLE INFORM-A-GRAM KEY NO. 1222

IN 11 SIZES No. 6 to 1" N.C. In all S. A. E. sizes.

You Need an Extra Hand Now to Speed Up Production!

HEIMANN TRANSFER SCREW SETS

Here is the *faster*, more precise way of transferring open and blind screw holes—make savings in "wage-dollars-per hour" of your expensive hands on every job. A die-and-tool maker's tool with many other applications for die makers and machinists. A set of 6 Hardened Screws nested in combination holder and wrench—no other tools needed. Get more work now—save money too!

HEIMANN MFG., CO. • URBANA, OHIO

CIRCLE INFORM-A-GRAM KEY NO. 1223

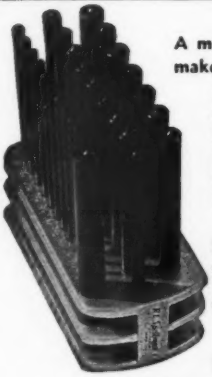
low cost
HYDRAULIC KEYSEATER
cuts standard, tapered keyways ¼" to 2" wide

- fast set-up—saves time and money
- low cost operation-uses standard tool bits
- heavy-duty hydraulic circuit—assures accurate keyways
- compact, 21" x 61"—no special foundation

Send for Bulletin 34

E. W. BLISS COMPANY
CANTON, OHIO

CIRCLE INFORM-A-GRAM KEY NO. 1224



SPELLMACO SPOTTERS

A matched set of transfer punches for toolmakers, machinists and tool cribs.

Used for transferring location of threaded, drilled and reamed holes, slugs, blanks, etc.

Precision made of finest tool steel carefully heat treated and tempered for long life. .0025 undersize to facilitate use—black oxide finish.

Set No. 3-17: 28 punches with indexed stand — sizes 3/32" to ½" by 1/64" plus hand 17/32" size—length 4⅞". PRICE only $17.90

Single size available.

R. L. SPELLMAN CO. • Urbana, Ohio

CIRCLE INFORM-A-GRAM KEY NO. 1225

Mold your own LEAD HAMMERS

Here's the inexpensive, fast way of molding and remolding your own lead hammers with this COOK mold and ladle. It produces hammers that can "take it" Simple to operate.

Write for circular and prices

COOK'S LEAD HAMMER SERVICE
68 Massasoit Avenue, East Providence 14, R.I.

CIRCLE INFORM-A-GRAM KEY NO. 1226

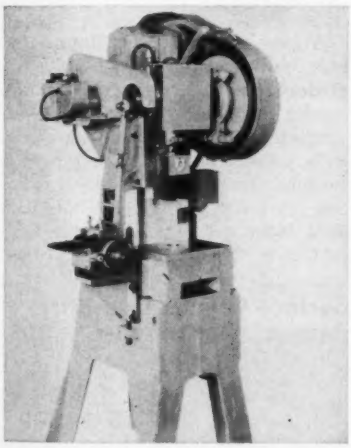
The Inform-A-Gram card which follows page 102 is for your convenience in making inquiries about advertised Products and Editorial items.

Spot Check Production

A new limit signalling comparator, ideal for receiving and small lot inspection or spot checking of production, is used with standard height stands or special fixtures for manual inspection. Air electronic kit adapts Model 765 for air gaging. Radio Corp. of America, Industrial and Automation Div'n, 12605 Arnold Ave., Detroit, or Circle Inform-A-Gram No. P27.

Fabricates Small Parts

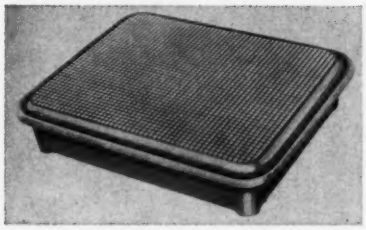
A new type high speed bench press was developed for fabricating small precision parts. This five-ton model operates at 450 to 900 spm, has a dovetail slide or round shank hole, a counterweighted shaft, and ⅜" eccentric stroke. Hudson Div'n, Emhart Mfg. Co., Hudson, N. Y., or Circle No. P28.



New Die Springs

Three new diameters of 37% deflection medium high-pressure chrome-vanadium steel die springs are now available from The Producto Machine Co., 990 Housatonic Ave., Bridgeport 1, Conn. They are ⅜", ½", and ⅝" dia, in 1" to 4" lengths. Get details from the company, or Circle Inform-A-Gram No. P29.

Lapping Plates



Fine grain lap iron lapping plates, now available in four sizes with flatness held to 0.0001", are annealed and heavily ribbed to assure retention of accuracy. Sizes run from 6" x 9" to 15" x 18". American Lap Co., 20184 Sherwood, Detroit 34, or Circle No. P30.

Repairs Anything

A new iron-like adhesive and sealer, Cycleweld liquid iron, is a putty-like synthetic plastic that sets up into a substance like iron a few hours after it's mixed with a clear liquid hardener. It can be ground, sanded, or drilled. Get data from Chrysler Corp., Detroit 31, or Circle No. P31.

PROTECT YOUR FUTURE
BUY U.S. SAVINGS BONDS
TODAY!

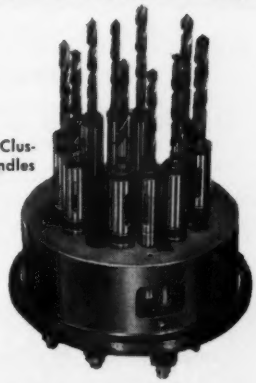
WISCONSIN multiple-spindle *Convertible* type head for drilling, tapping, spot facing, counterboring

If you have found that *convertible type heads* fit into your production program most effectively, you will want to profit by the experience of the WISCONSIN engineering staff in designing and building heads of this type.

WISCONSIN designs and builds all of the popular and widely used types of drill heads: Standard Multiple-Spindle Adjustable drilling and tapping heads; Fixed Spindle drilling and tapping heads; Rotating Heads; Bracket-Type Universal Joint Drill Heads and special machinery.

Master Drive Head with Pick-off Gears.

Cluster Box Housing showing Hole Pattern. Can be furnished with round, square or rectangular positioning.



Multiple-Spindle Cluster Plate with Spindles and Idler Gears.

Slip-Type Spindle with Idler Gears used in all convertible-type heads.

CONSULT OUR FIELD ENGINEERS OR WRITE —

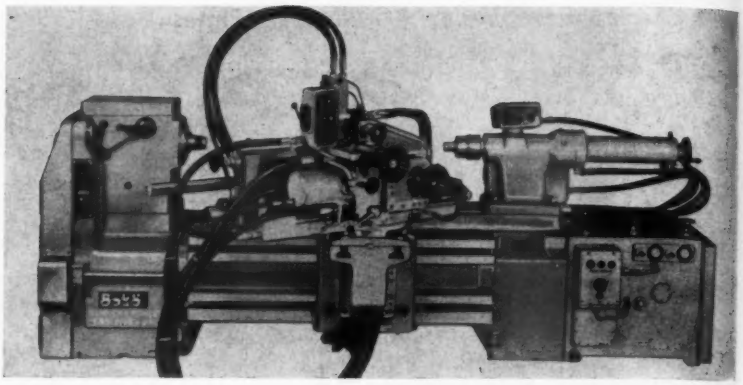
WISCONSIN DRILL HEAD CO.

4985 NORTH 124TH STREET • BUTLER, WISCONSIN

CIRCLE INFORM-A-GRAM KEY NO. 123

Product News

Building Block Lathe for Simple or Complex Jobs



Meet production needs with this new D35 Series Bokoe spinning and flow forming lathe line that ranges from a basic hand-operated machine to the Hycoform (pictured), designed to mass-produce cylindrical and tapered parts. It has a 42" center distance, 6" cross slide travel, 28" maximum swing, and 16" longitudinal slide travel. The Cosa Corp., 405 Lexington Ave., New York 17, or Circle Inform-A-Gram No. P32.

SYNTRON Vertical Vibratory
PARTS FEEDERS

Lower production costs by reducing parts handling costs

SYNTRON Parts Feeders automatically orient and feed small parts of almost every size, shape and material to automatic assembly machines, such as shown in photo above, at instantly controlled rates of flow to match production line speeds—without breaking or damaging parts. They are easily adaptable to most operations by the use of gravity feed tracks that deposit parts where and as they are needed.

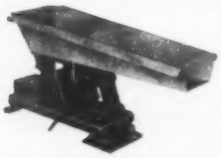
Working on an electromagnetic principle eliminating motors, gears, bearings, and etc.—SYNTRON Parts Feeders assure less down time and lower maintenance.

SYNTRON can help with all your parts handling problems—

Write for illustrated brochure — FREE

SYNTRON COMPANY
341 Lexington Avenue Homer City, Pa.

Other SYNTRON Equipment of proven dependable Quality



VIBRATORY FEEDERS

BIN VIBRATORS

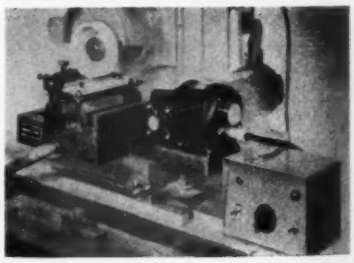
BATTERY CHARGERS

CIRCLE INFORM-A-GRAM KEY NO. 124

New Carbide Toolholder

A new locking insert and adjustable chip-breaker in the universal-positioning Throway carbide toolholder provides for wider use with triangular and diamond-shaped carbide inserts. Holder doesn't have to be removed from machine for indexing carbides. Maxwell Industries, Inc., 493 E. 5th St., Ashtabula, Ohio, or Circle No. P33.

Surface Grinder Converter



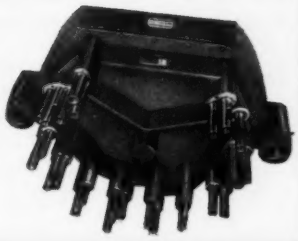
A portable grinder attachment converts any surface grinder into a precision OD, ID, and centerless grinder. Exceptional speeds and unconventional cuts are possible along with savings on both occasional jobs and production runs. Rough turning operations sometimes are eliminated. Unison Corp., 1805 S. Stephenson Hwy, Royal Oak, Mich., or Circle Inform-A-Gram No. P34.

This THRIFTMASTER

Fixed Center

DRILLHEAD

does 27 jobs in 1 fast operation!



Get maximum production — use Thriftmaster designed and built Fixed Center Drillheads . . .

- Full ball bearing construction
- Fully hardened chrome-moly steel gears, spindles and drives
- All sizes, any number of spindles
- All types, including angular, rotating and lead screw
- For drilling, tapping, reaming, boring and milling
- Guaranteed performance backed by over 25 years of engineering and production experience

Also Full Ball Bearing Universal Joint, Single and Double Eccentric Adjustable Drillheads and Dorman Tappers.

Write, wire or phone for complete information today.

THRIFTMASTER Products Corporation
A SUBSIDIARY OF THOMSON INDUSTRIES, INC.

1012 N. Plum Street
Lancaster, Penna.

CIRCLE INFORM-A-GRAM KEY NO. 1251

The PUNCH WITH A **Punch**

Items shown here are stock. Usual shipment within 48 hours of order receipt.

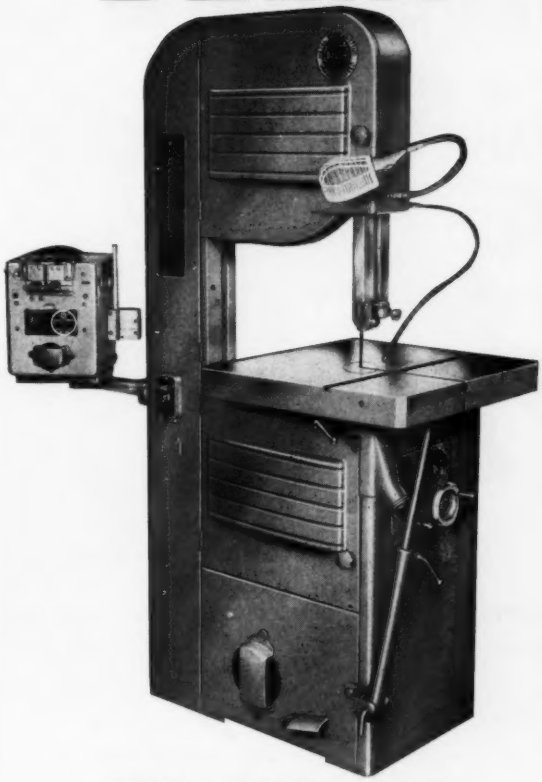
Specials made to your specifications.

Send to Dept. A for catalog.

DING PUNCH & DIE
INCORPORATED
Jamestown, New York

CIRCLE INFORM-A-GRAM KEY NO. 1252

NEW
from
DELTA



20" metal-wood
Variable Speed
BAND SAW

Now you can have the Band Saw features you said you wanted most—*and for less than $900!* This all-new Delta Band Saw (shown with optional blade welder) gives *greater accuracy, better cutting performance* with:

WIDE RANGE VARIABLE SPEED DRIVE—50 to 4500 FPM—cuts stainless steel, aluminum, wood, plastics.

SCIENTIFICALLY DESIGNED BLADE GUIDES—give maximum blade support for heavy metal cutting.

RUGGED FRAME CONSTRUCTION—massive, rigid internal frame with modern fabricated exterior.

SEE IT AT YOUR NEAREST DELTA DEALER—he's listed under "TOOLS" in the Yellow Pages—or write: Rockwell Manufacturing Company, Delta Power Tool Division, 622J N. Lexington Ave., Pittsburgh 8, Pa.

DELTA INDUSTRIAL TOOLS
another fine product by
ROCKWELL

CIRCLE INFORM-A-GRAM KEY NO. 1253

PRODUCTION KNURLING OF SHAFTS

The Model 195-S With Hopper & Chain Conveyor Feed Will Knurl Cores, and Remove Forging Die Flash at The Rate of 4000 Per Hour

Vibrating hopper orients the cores and delivers them head up to the transfer station. They are transfered to the chain conveyor, carried to the rotating feed drum thru a maze, then knurled and burnished by rolling under concave dies. Parts are ejected automatically after knurling.

Spring loaded die head compensates for variations in diamentor.

Let our engineers recommend equipment for your knurling applications.

Write or call EAstgate 7-0300.

IF IT'S WORTH MAKING, IT'S WORTH MARKING.

GEO. T. SCHMIDT, INC.
4112 Ravenswood Avenue
Chicago 13, Illinois

CIRCLE INFORM-A-GRAM KEY NO. 1261

ACME TAPS From Stock!

HIGH PRODUCTION TYPE
with Exclusive
"Lead Screw Pilot"

Improve Acme Tapping with Single Pass Acme Taps. Eliminate Shaved Threads, Improve Finish, Reduce Machining Time.

H&R
The Threading Specialists
5850 Marshall St., Oakland 8, California
OUR 23RD YEAR

CIRCLE INFORM-A-GRAM KEY NO. 1262

GAGE COMPANY *Deep-Etch*

PRECISION PLASTIC • NON-BREAKABLE

COMPARATOR SCALES

Highly accurate and designed for making quick measurements at scale on projectors and comparators without any movement of machine or work.

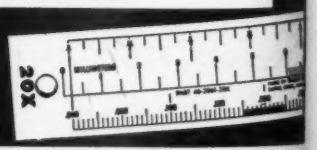
Supplied on Gage Company Precision Plastic . . . a sturdy, non-breakable material of constant stability, .125 in thickness.

Unexcelled as a tool for use in drafting and engineering scale layouts for use on comparators.

Available in all standard magnifications and in several lengths. Various styles for all applications.

WRITE FOR BULLETIN NO. 58-70

GAGE COMPANY
. . . BOX 1080
Battle Creek, Michigan



CIRCLE INFORM-A-GRAM KEY NO. 1263

Product News

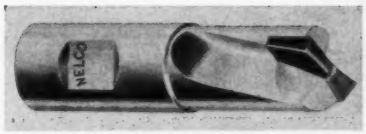
Versatile Wet Blaster

Honing, cleaning, deburring, and blending can be performed quickly and efficiently by Liqui-Breez Model

LB-1002 wet blaster. By honing, the cutting efficiency of high speed steel and tungsten carbide cutting tools can be increased as much as 500%. Literature available from Tobin-Arp Mfg. Co., 6400 Penn Ave., South, Minneapolis 23, or Circle Inform-A-Gram No. P35.

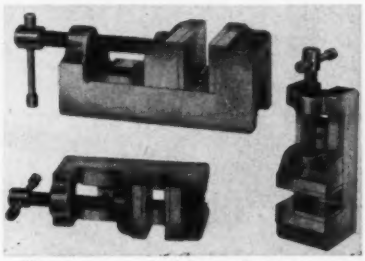
End Mill Line

Recommended for all materials, this two-flute carbide-tipped end mill is designed for plunge cutting and peripheral milling. Radial hook gives freer shearing action in plunge cuts. Series 600 has ⅜" to 1" range.



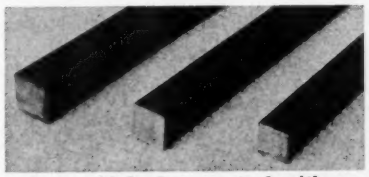
Cutting Tool Div'n, Brown & Sharpe Mfg. Co., Providence 1, or Circle Inform-A-Gram No. P36.

Grinding Vises

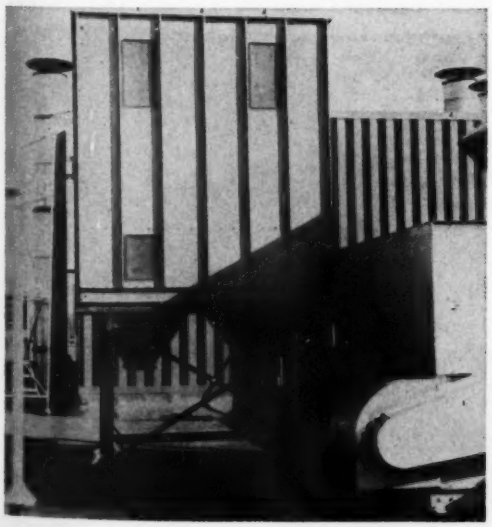


Two new precision vises are accurately ground to 0.0005" and are made of high grade grey iron. No. 11 has 1½" jaw width and 1½" opening. Palmgren Steel Products, 8383 S. Chicago Ave., Chicago 17, or Circle Inform-A-Gram No. P37.

Small Bar Die Steel

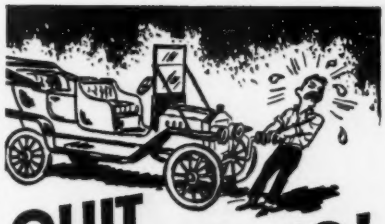


A new high chrome steel with excellent abrasive resistance and more durable, fine cutting edge is now available in small bar sizes. Used for blanking, drawing, stamping, or forming dies. Made in ¼", 5/16", and ⅜" sizes. Darwin & Milner Inc., 2345 St. Clair Ave., Cleveland 14, or Circle Inform-A-Gram No. P38.



Clean Air Filter House

Large volume air filtration and recirculation problems are now handled by this cloth-type filter house for eliminating dust. FH Filterkop receives air, precleaned by cyclone separators, for final separation. Up to 10,000 cfm can be recirculated. For details, write Aget Mfg. Co., Adrian, Mich., or Circle Inform - A - Gram No. P39.



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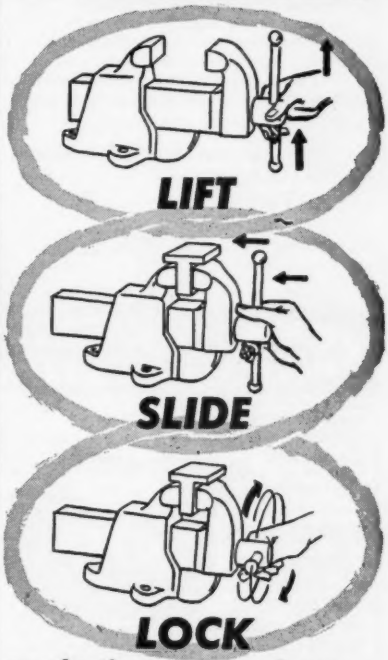
...NEW model CARDINAL
SPEED VISE
SLIDES!



production costs go down
production capacity goes up!

BUY CARDINAL

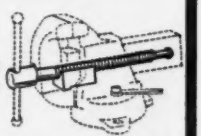
Modern plants require modern tools. The cost is quickly repaid in increased efficiency and time saved.

SIZES, 3½", 4", 4½" stationary or swivel base.

SOLD EVERYWHERE

FAST - SIMPLE POSITIVE

Patented undercut thread of screw and nut assure positive locking.



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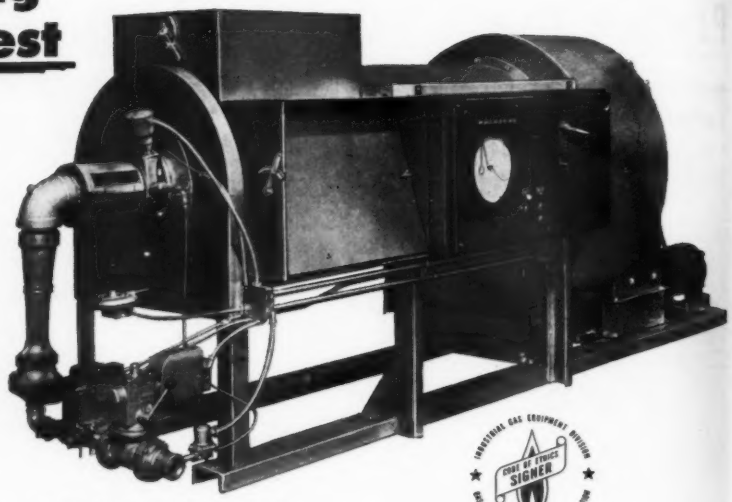
Heat Processing with NEW G. A. S. at its best

UTILITY AIR HEATER

A complete package unit, modern as tomorrow in both design and performance, this new direct gas-fired line of industrial heaters comes to you complete with control cabinet, temperature and safety instruments, fan and motor, wired for immediate operation. Can be furnished for remote control wiring. Capacities range from 125,000 BTU's/hr., to 4,000,000 BTU's/hr.,—temperatures to 600°F. in standard models and to 1,000°F., in famous G.A.S. Rapidry Models. Features injector type atmospheric type burners (combination gas-oil burners when desired), heavy-duty industrial type blower, and electrical ignition. Exceptionally quiet operation.



Model 409H illustrated.
Capacity 2,000,000 BTU's/hr.
Complete with controls.

Request complete information.

GAS APPLIANCE SERVICE, INC.
Heat Process Engineers
1936 West Balmoral Ave. • Chicago 40, Ill.
Representatives in Major Industrial Areas

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Mahr INDICATING MICROMETER and COMPARATOR With the VISIBLE FEEL

WILL DETECT OUT-OF-ROUNDNESS — OVALNESS — TAPERED CONDITION IN 1/10,000" — 0-1" Range

TENTHS VERNIER

ONLY $99.50 IN HARDWOOD CASE

LARGER SIZES UP TO 12" AVAILABLE

A RIGHT HAND TOOL
Release Button for Movable anvil on right hand side enables operator to hold tool the conventional way.

NEW!
Resetting to Zero in Seconds. Quick Adjustable Tolerance Hands. HEAVY TUNGSTEN CARBIDE tipped Measuring Anvils. STAINLESS STEEL, one-piece spindle and screw, hardened with Ground Threads — Permanently Rustproof.

3 TOOLS IN ONE
COMPARATOR
Master MICROMETER
"GO" & "NO GO" GAGE - 1" Range in .0001"

GUARANTEED Mahr QUALITY

INDICATING BENCH MICROMETER with NON-ROTATING Spindle

ONLY $170.00 IN HARDWOOD CASE

Range 0-1"

Reading .000050" from dial.

Directly reading in .0001" from micrometer. 1-3/4" thimble dia. Dull chrome finished.

Here is a SUPER PRECISION MEASURING MACHINE for the measuring of small and delicate parts for Tool and Instrument making.

USE IT AS A COMPARATOR
Anvils RETRACTABLE for rapid repeat measurements. Adjustable Tolerance Hands. Instant Zero adjustment of indicator.

20 MILLIONTHS INDICATOR READING AVAILABLE

FEATURING . . .
Adjustable Measuring Pressure to any desired tension. Non-rotating Spindle assuring absolute parallelism of anvils.

Eleven Types of INTERCHANGEABLE Measuring Anvils available.

IF NOT AVAILABLE AT YOUR FAVORITE SUPPLY HOUSE — WRITE TO US FOR ILLUSTRATED FOLDER.

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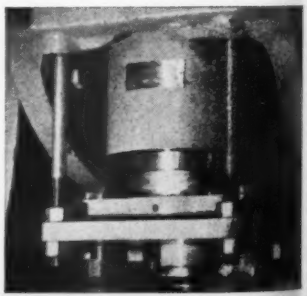
DIE CUSHIONS

by Dayton Rogers

FOR ALL PUNCH PRESSES

to assure accurate working pressure on all dies

- Single installations from 1 ton to multiple installations of unlimited capacity, standard or designed on the job.
- Quotations on request.
- Best possible delivery.



11 Ton Full Universal Pneumatic Die Cushion Installed on inclinable→ Press.

WRITE FOR CATALOG P-44-A

DAYTON ROGERS *Manufacturing Company*

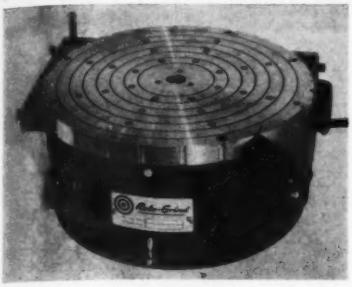
MINNEAPOLIS 7B, MINNESOTA

CIRCLE INFORM-A-GRAM KEY NO. 1283

Product News

Rotary Grinding Table

This Model 710-V powered rotary grinding table can also be used as an index table for inspection or production. It's hand operated and

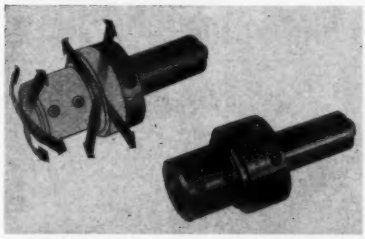


gives a combination index of 2, 3, 4, 6, 8, 12, and 24 for jig grinding, drilling, or grinding equally spaced holes. With it parts can be quckly drilled without fixturing or drill jigs. M & M Tool and Mfg. Co., 1124 E. 3rd St., Dayton 2, Ohio, or Circle No. P40.

Economical Mandrels

Straight jaw mandrels need only 14 tools for range of ⅜" to 3¼" dia. Model GB mandrels are used for all operations except the highest precision finishing, and are ideal for smaller shops, toolroom, and maintenance. Le Count Tool Works, Inc., 38 Cody St., W. Hartford 10, Conn., or Circle Inform-A-Gram No. P41.

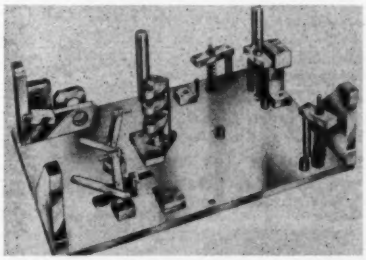
Lathe Tool Holder



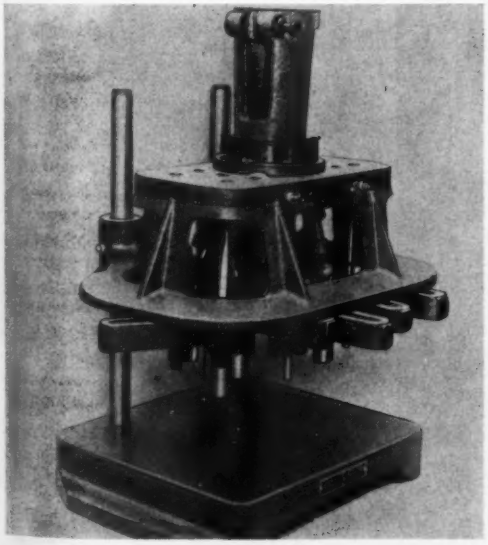
Both radial and angular misalignment between the center-line of spindle and turret holder is corrected by a new Tru-Align turret lathe toolholder. Thus the tool feeds into the work in perfect alignment with the spindle. It holds position and locks. Sonnet Tool and Mfg. Co., 576 N. Prairie Ave., Hawthorne, Calif., or Circle No. P42.

Coated Tooling Plate

Reynolds No. 33-HC has a hard anodic coating that eliminates burring or galling and is preferred for



drill jigs, mill fixtures, stripper plates, pressure pads, guide rails, and other jobs, which are fabricated without machining the 100% coated surface. Bulletin available from Reynolds Aluminum Supply Co., 2929 S. Santa Fe Ave., Los Angeles, or Circle Inform-A-Gram No. P43.



Large Drill Head

A new Model 1100 Knuckle-Head can be used for either drilling or tapping with from 2 to 11 spindles. It converts any single-spindle drill press into high production multi-hole operation by just changing a single face plate. Has up to 5/16" capacity in steel. Ettco Tool & Machine Co., Inc., 594 Johnson Ave., Brooklyn 37, or Circle No. P44.

HARDNESS TESTING
has been done with the SCLEROSCOPE
Since 1907
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THE SHORE INSTRUMENT & MFG. CO., Inc.
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CAMS
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LIFTING DEVICES
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FAST-SAFE-BETTER Material Handling
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• SHEETS
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400 MODELS
Prompt Delivery
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MINIATURE DRILL BUSHINGS
Hole Sizes—No. 80 to 3/32"
O.D. 3/32" to 13/64"
Lengths ¼" to 3"
.0002 Tolerance on I.D. O.D., and Concentricity
Specials to your specifications
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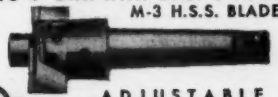
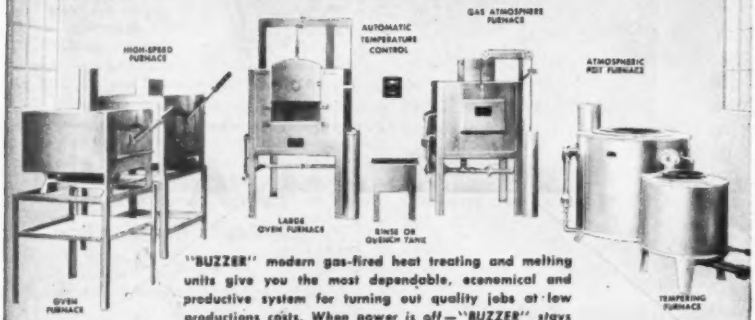
HOLES
1" TO 4" DIA. WITH ONLY 5 TOOLS
M-3 H.S.S. BLADES



Clark ADJUSTABLE COUNTERBORES
P. O. BOX 990 BEVERLY HILLS, CALIFORNIA

CIRCLE INFORM-A-GRAM KEY NO. 1295

MORE HEAT TREATING VOLUME
with BASIC "BUZZER PACKAGE"
NO BLOWER OR OTHER POWER NEEDED
... just connect to gas supply



"BUZZER" modern gas-fired heat treating and melting units give you the most dependable, economical and productive system for turning out quality jobs at low productions costs. When power is off—"BUZZER" stays on the job! Standard and special furnaces, large or small, available to equip your shop to exact requirements.

COMPLETE LINE OF BUZZER REG. U.S. PAT. OFFICE BURNERS FOR CLEANING, RINSING, PICKLING AND SUNDRY HEAT OPERATIONS

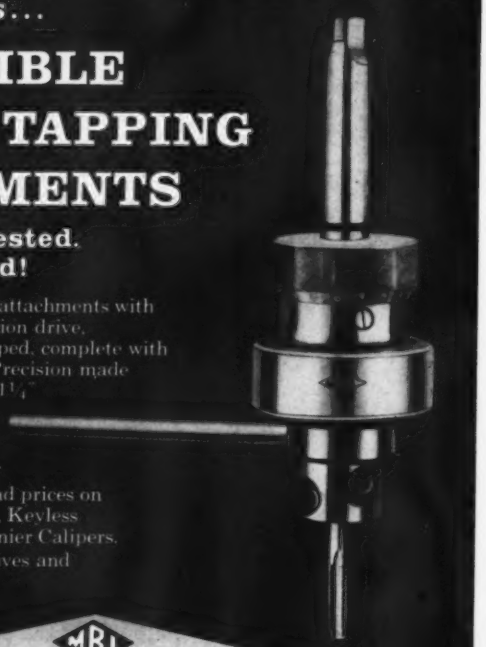
WRITE TODAY FOR NEW "BUZZER" CATALOG
CHARLES A. HONES, INC.
HEAT TREATING EQUIPMENT SPECIALISTS SINCE 1911
153 S. Grand Avenue, Baldwin, L. I., N. Y. • BAldwin 3-1110
CIRCLE INFORM-A-GRAM KEY NO. 1301

Tops for Taps...
REVERSIBLE SAFETY TAPPING ATTACHMENTS
Performance Tested. Economy Priced!

Reversible safety tapping attachments with adjustable graduated friction drive, hardened, ground and lapped, complete with torque bar and handles. Precision made throughout. Capacities to 1¼"

Complete repair facilities available—replacement parts in stock.

Write also for literature and prices on MBI Multi-Purpose Vises, Keyless Drill Chucks and Dial Vernier Calipers. Manufacturer representatives and dealer inquiries invited!



MBI
M.B.I. EXPORT AND IMPORT Ltd.
A DIVISION OF MACHINERY BUILDERS, INC.
475 Grand Concourse, Bronx 51, N. Y.
"Over 25 years' experience in designing and building machinery"

CIRCLE INFORM-A-GRAM KEY NO. 1302

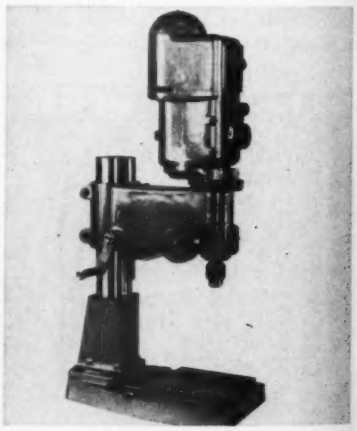
Product News

Dual Job Tester

This new vertical bench-mounted tensile tester easily converts to perform compression tests. Model TE-

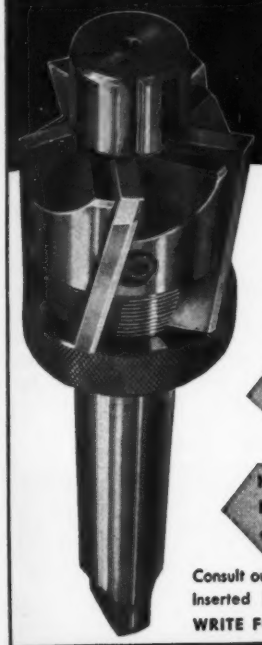
10's lower jaw holder is adjustable to three positions. It accommodates workpieces up to 7" long, 1" to 4" wide, and ½" to 4½" high, depending on jaws used. Steel City Testing Machines, Inc., 8817 Lyndon Ave., Detroit 38, or Circle Inform-A-Gram No. P45.

Small Drill Press



Infinitely variable speed from 1200 to 7200 rpm and a ⅜" drilling capacity in steel are features of Arboga EV-10 drill press. It has 18" swing, 3" quill travel, 12" maximum distance from spindle to table, and 10" x 17" table. Homestrand, Inc., 9 Addison St., Larchmont, N.Y., or Circle Inform-A-Gram No. P46.

INSERTED BLADE GENESEE
FACING AND COUNTERBORING TOOLS



Interchangeable Pilots

Constant Chip Space Throughout Life of Blades

Standard Sizes 1¼ to 4 Standard with Straight or Morse Taper Shanks

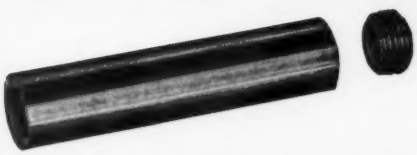
H. S. S.—Carbide Tipped Blades. Save 25% or more over cost of Solid Tools

Consult our Engineering Department on your Inserted Blade Production Tool Problems.
WRITE FOR CATALOG 54P

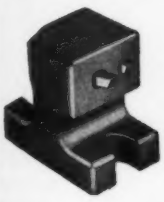
GENESEE MANUFACTURING COMPANY
566 HOLLENBECK ST. • ROCHESTER 21, N. Y.
Adjustable Hollow Mills • Facing and Counterboring Tools • Special Production Tools • Since 1908

CIRCLE INFORM-A-GRAM KEY NO. 1311

How SQUARE HOLED SLEEVES SPEED UP TOOL-MAKING!



One of the most difficult problems in tool making can be solved easily and quickly with Sturdy Square Holed Sleeves. The perfection of broached square holes can be had in boring bars, milling cutters and many other applications at a small fraction of the cost of imperfect hand-made square holes. The Sturdy Square Holed Sleeve consists of a round sleeve with a perfectly square hole broached through the center. This hole is tapped at one end to receive a back-up screw which is furnished with the Sleeve. The Sleeve can be sweated or pressed into a drilled and reamed hole to make a perfectly square accurate hole in a very few minutes.



The Sturdy Square Holed Sleeve will save you many hours and many dollars in the making of boring bars, tool holders and other tools requiring square holes.

SLEEVES MADE IN FOLLOWING SIZES:
3/16, ¼, 5/16, ⅜, 7/16, ½, ⅝, ¾, 1"

STURDY BROACHING SERVICE, INC.
23516 TELEGRAPH RD., DETROIT 41, MICH.

Write for Literature

CIRCLE INFORM-A-GRAM KEY NO. 1312

Lepel
HIGH FREQUENCY INDUCTION HEATING UNITS

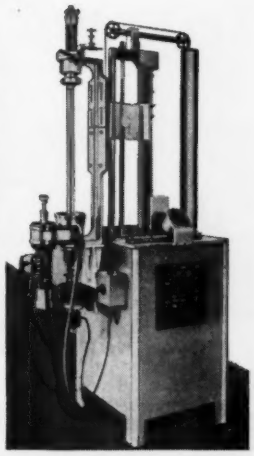
The Lepel line of induction heating equipment represents the most advanced thought in the field of electronics as well as the most practical and efficient source of heat yet developed for numerous industrial applications.
If you are interested in induction heating you are invited to send samples of the work with specifications. Our engineers will process and return the completed job with full data and recommendations without any cost or obligations.

FLOATING ZONE FIXTURE FOR METAL REFINING AND CRYSTAL GROWING

A new floating zone fixture for the production of ultra-high purity metals and semi-conductor materials. Purification or crystal growing is achieved by traversing a narrow molten zone along the length of the process bar while it is being supported vertically in vacuum or inert gas. Designed primarily for production purposes, Model HCP also provides great flexibility for laboratory studies.

Features

- A smooth, positive mechanical drive system with continuously variable up, down and rotational speeds, all independently controlled.
- An arrangement to rapidly center the process bar within a straight walled quartz tube supported between gas-tight, water-cooled end plates. Placement of the quartz tube is rather simple and adapters can be used to accomodate larger diameter tubes for larger process bars.
- Continuous water cooling for the outside of the quartz tube during operation.
- Assembly and dis-assemby of this system including removal of the completed process bar is simple and rapid.



Model HCP

Electronic Tube Generators from 1 kw to 100 kw.
Spark Gap Converters from 2 kw to 30 kw.

WRITE FOR THE NEW LEPEL CATALOG . . . 36 illustrated pages packed with valuable information.

All Lepel equipment is certified to comply with the requirements of the Federal Communications Commission.

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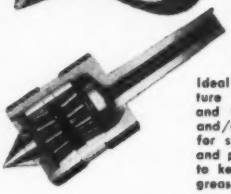
55th STREET and 37th AVENUE WOODSIDE 77, NEW YORK CITY, N. Y.

CIRCLE INFORM-A-GRAM KEY NO. 1313

IDEAL GOLD BAND
LIVE CENTERS
GUARANTEED TO MATCH OR EXCEED, "CRITICAL" JOB SPECIFICATIONS

In the GOLD BAND line Ideal has combined the latest production methods with their traditionally fine craftsmanship to bring you an unequalled standard of excellence in live centers. Accurate, (to ± .0001") GOLD BAND Live Centers offer "custom" quality at production prices. Specify GOLD BAND Live Centers and your every need can be accommodated from stock . . . 99 times out of 100. Ideal's GOLD BAND Live Centers offer savings, simplified operations and higher lathe output both in quantity and quality. Contact your distributor today...or



PRECISION FITTED BEARINGS

Ideal Live Centers feature precision machined and hardened ball and/or roller bearings for superior accuracy and performance. Sealed to keep dirt out, grease in.

A COMPLETE LINE FOR EVERY NEED...SPECIALS, TOO!

Send for
Complete catalog data and specifications.

IDEAL INDUSTRIES, Inc.
1334-I Park Ave., Sycamore, Ill.
DISTRIBUTED BY THE NATION'S LEADING INDUSTRIAL DISTRIBUTORS

CIRCLE INFORM-A-GRAM KEY NO. 1321

do your
Ductility Testing
quick & easy

The turning of a single hydraulic control knob clamps the specimen, tests it, then releases it The test is made in plain view, and the maximum pressure indicators show the result until reset. This highly sensitive sheet metal tester will take up to 3/16" thick specimens and exert up to 30,000 pounds pressure, at any desired rate of speed. Hydraulic mechanism is all neatly enclosed. Write for catalog sheet and prices.

DETROIT TESTING MACHINE COMPANY
9386 Grinnell Ave., Detroit 13, Mich.
CIRCLE INFORM-A-GRAM KEY NO. 1322

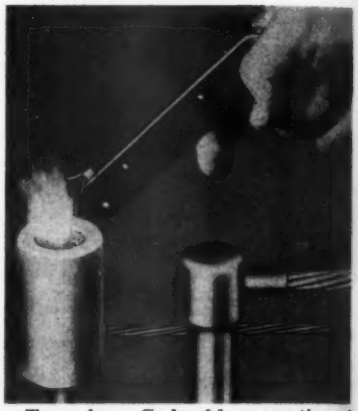
Product News

New Air Hose

Hot and cold weather won't affect the new air hose developed by Synflex Products Div'n, Samuel Moore

& Co., Mantua, Ohio. It's lighter weight and greater flexibility make it ideal for portable air-operated tools and jigs and fixtures. Get details from company, or Circle Inform-A-Gram No. P47.

"One Shot" Mold



To make a Cadweld connection of a cable to round rod just use the Cadweld powder cartridge, a metal disk, a wrap seal, and a ferruled sleeve. The connections cannot loosen or corrode. Get bulletin from Erico Products Inc., 2070 E. 61st Pl., Cleveland 3, or Circle Inform-A-Gram No. P48.

Economical Retainers

Pick out the right size retaining rings at glance from an improved Econokit, that contains 400 cadmium plated Truarc items in 84 sizes from ¼" to 2½", in internal, external, and universal crescent ring designs. Packaged Merchandise Co., 3065 W. 117th St., Cleveland 11, or Circle Inform-A-Gram No. P49.

NOW A COMPLETE ENGINEERING AND DESIGN SERVICE — UNDER ONE ROOF!

- From Process Planning to Packaging
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Aeromotive Designers, Inc.
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CIRCLE INFORM-A-GRAM KEY NO. 1331

FOR ULTIMATE PROJECTION ACCURACY
Leitz 8" OPTICAL COMPARATOR PLUS
GAGE Deep-Etch STANDARD OR SPECIAL CHARTS

COMPARATOR has:
- Vertical light beam
- 3 selective filters
- Indexing lens turret for 10, 20 & 50x
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DEEP-ETCH CHART SERVICE MEANS:
- Precision plastic
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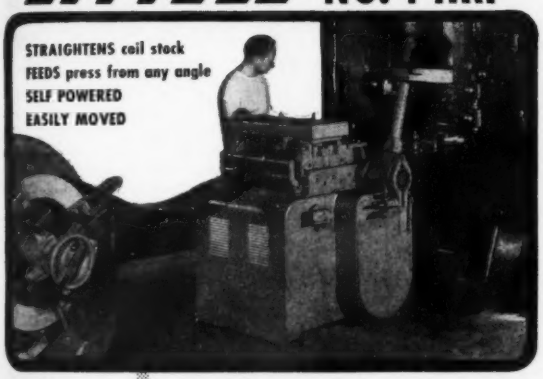
- Facilities for developing Special Charts

Request 8-page catalog TP200

OPTO-METRIC TOOLS, INC.
137 TP VARICK STREET • NEW YORK 13, N.Y.

CIRCLE INFORM-A-GRAM KEY NO. 1333

LITTELL NO. 4 HRP



The straightening-feeding action of this HRP (Hydraulic Rack and Pinion Straightener-Feed) is synchronized to the speed of the press with one electrical connection. Two standard sizes for maximum stock width of 12" and 18" and thicknesses up to .125". (Special 24" width machines not stocked.) Standard 19" feed lengths double cycled to 38".

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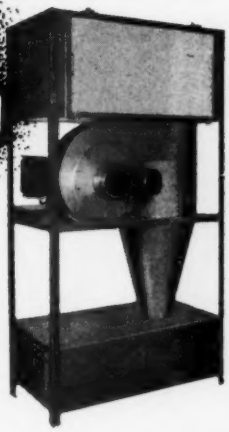
CIRCLE INFORM-A-GRAM KEY NO. 1332

EFFICIENT—LOW COST
Dust Collection



Easy installation . . . efficient low-cost operation . . . simplified maintenance, make Dustkop *FIRST* among equipment to collect most all industrial dusts. There are Dustkop models to eliminate your dust problems . . . that are space saving, self-contained units, or exhaust type for rafter, ceiling or outside location. Write for descriptive literature.

DUSTKOP® STOPS DUST

37 STANDARD MODELS TO CHOOSE FROM
• READY TO USE

Also a Complete Line of Mist Collectors

AGET MANUFACTURING COMPANY
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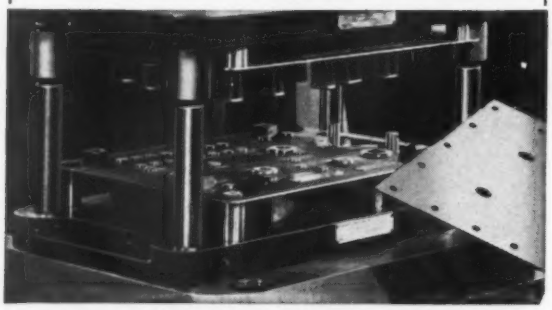
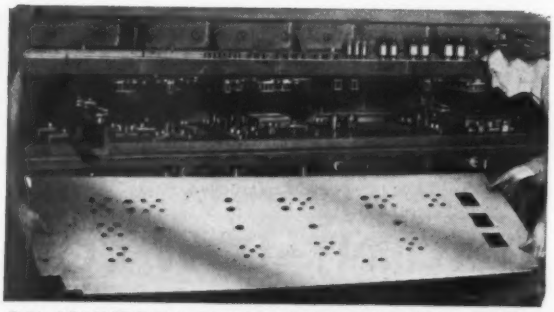
OVER 2700 PLANTS
are saving money with
WHISTLER DIES



MAGNETIC PERFORATING DIES

All parts reusable and interchangeable. Punches and dies stocked in .001" increments from .100" thru .500" dia. Larger sizes available.



ADJUSTABLE PERFORATING DIES

All parts reusable and interchangeable. Punches and dies stocked in .001" increments from .100" thru .500" dia. Larger sizes available.

manufacturer of all types of CUSTOM DIES for over 40 years

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748 Military Rd., Buffalo 23, N. Y.

Mail the following: ☐ Magna-Die Catalog ☐ Adjustable Die Catalog
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It pays and pays and pays...

to use L&S SAWS & KNIVES CUSTOM MATCHED TO YOUR PARTICULAR APPLICATIONS!

A large mid-west manufacturer of decorative laminates reports 400% longer life between grinds with L&S customized carbide-tipped saws.

SOLD ON TERMS THAT GUARANTEE COMPLETE SATISFACTION

90% or more of our carbide knives and carbide-tipped saws are custom built from materials of selected hardness to specific production requirements. As a result, they invariably far out-perform other saws and knives in the carbide category both in cutting efficiency and reduction of downtime and number of grindings required. Savings over conventional steel knives and saws are almost unbelievably large. By all means write for our catalog before buying any carbide tipped saws or solid carbide knives for planers, shapers, molders, or any other application.

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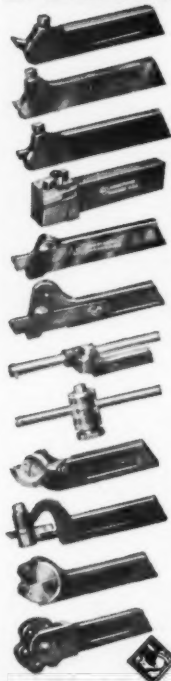
2618 THORNWOOD ST., S.W. • GRAND RAPIDS 9, MICH.
We Repair All Types and Makes of Carbide-Tipped Saws . . . 24-Hour Service

CIRCLE INFORM-A-GRAM KEY NO. 1342

ARMSTRONG
TOOL HOLDERS



A Correct Tool for Every Lathe Operation

You can save time (and money) by ensuring that your machine tools are equipped with *adequate numbers* of the correct ARMSTRONG Tool Holders. The ARMSTRONG System of Tool Holders includes correctly designed tools for *every* standard operation on lathes, shapers, and planers, and for many operations on turret lathes and screw machines. By utilizing the ARMSTRONG System of Tool Holders, you can reduce tooling costs, eliminate down time in tooling up, operate your machine tools at maximum feeds and speeds.

ARMSTRONG Tool Holders are long-lasting tools. They are strong beyond need, handy and efficient, profitable to use, and are readily available from your local ARMSTRONG Distributor.

Check over your ARMSTRONG Tool Holder needs. Write for literature.

If you do not know the name of your local ARMSTRONG Distributor, inquire when asking for literature.

ARMSTRONG BROS. TOOL CO. 5223 W. ARMSTRONG AVE. CHICAGO

CIRCLE INFORM-A-GRAM KEY NO. 1343

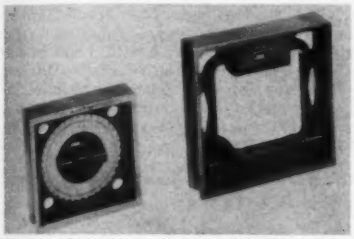
Product News

Forgeable Tungsten

Sintered tungsten and tungsten alloy billets and preformed shapes, all readily forgeable, are available from Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30. Hollow conical and cylindrical shapes up to 8" dia and 4" long, and 4½" dia and 12" long billets are available. Write company for data, or Circle Inform-A-Gram No. P50.

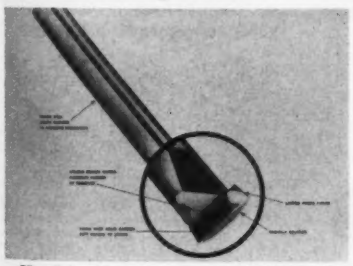
Two Leveling Squares

Checking squareness between machine members can be done easily with the solid square, available in

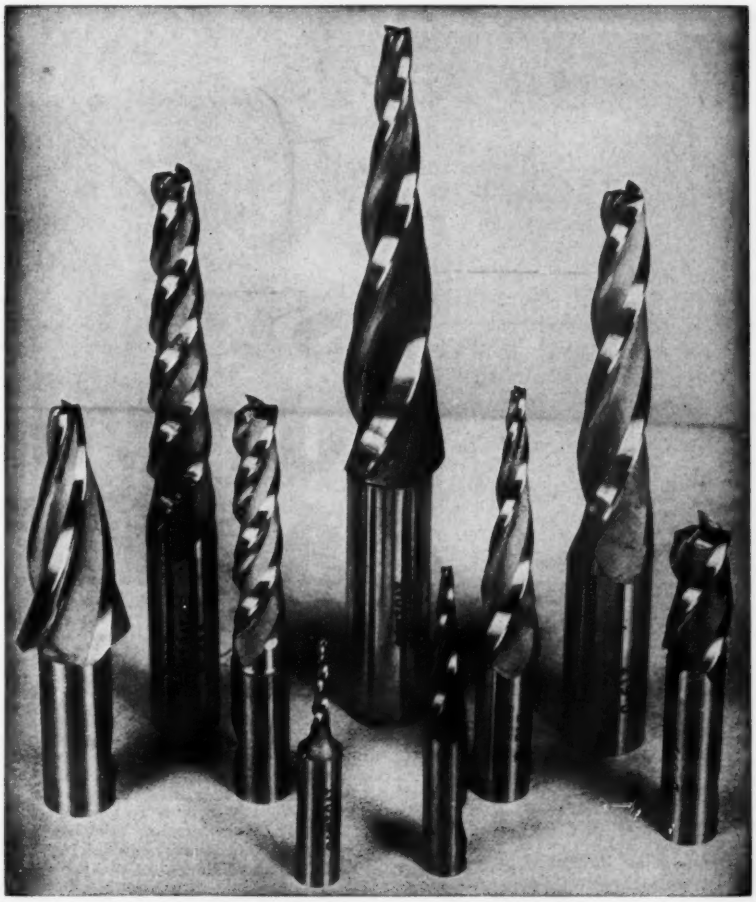


three degrees of sensitivity. The other square, really a simplifed Clino-Meter, has a 0-180-0° range with vernier reading in 6 min of arc. Both are in Catalog 82/555, available from Opto-Metric Tools, Inc., 137 Varick St., New York 13, or Circle No. P51.

Carbide Boring Bar



Used in jig borers and lathes, this Bor-Bar features extra wide solid carbide, butt brazed to a tough steel shank and lapped. It's accurate, smooth cutting, and chatter free. Jarvis Corp., Middletown, Conn., or Circle Inform-A-Gram No. P52.



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and forward for our new 16-page catalog.

CONICAL TOOL CO. 3890 Buchanan S.W.
Grand Rapids 8, Michigan

CIRCLE INFORM-A-GRAM KEY NO. 1351

GRIND-DEBURR-POLISH
Faster and Easier with a
DREMEL MOTO-TOOL

No other grinder, regardless of size, power, or price can take the place of the Dremel Moto-Tool. It's lightweight (16 ounces) and handles like a pencil. Gives the operator extreme accuracy for close-tolerance work—and easy operation in tight places impossible to reach with large grinders. The Moto-Tool's high speed (27000 RPM) makes it ideal for use with small mounted wheel points. It's also handy for production deburring, and a perfect size and weight for women operators.

The Dremel Moto-Tool is an indispensable, all-purpose grinder for the tool room—a time-saver for the production line—an industrial favorite since 1936.

Order from Your Supplier or Write for Tool Catalog

Model No. 2 Moto-Tool only .. **$19.95**
Model No. 2 Moto-Tool Kit with 23 accessories and storage case .. **$27.50**

DREMEL MFG. CO., Dept. 529J, Racine, Wisconsin

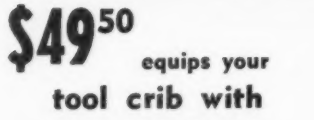
CIRCLE INFORM-A-GRAM KEY NO. 1352

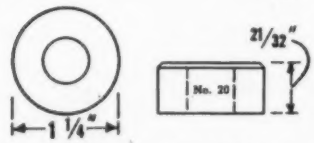
$49.50 equips your tool crib with

NO. 32 WARD PUNCH AND DIE KIT

Cabinet and **29** Punches and Dies 1/16" to ½" by 1/64" graduations.

No. 820 Style





Can also be furnished in drill sizes No. 1 to 56. Send for full particulars.

Catalog 157 AG

Covering our vast stock of **Ward Standard Button** and **Leader Pin Die Sets.**

WARD
MACHINERY COMPANY
564 West Washington Boulevard
Chicago 6, Illinois
Tel.: STate 2-9440

CIRCLE INFORM-A-GRAM KEY NO. 1361

Core Drill: 25 sizes from 1½" to 3" dia. in H.S.S.

C'sink, Style "B": 6 sizes from ½" to 2" dia. in H.S.S.

C'bore, Style "B": 32 sizes from 7/16" to 3" dia. in H.S.S. and carbide.

stub taper drive makes a difference in tool cost

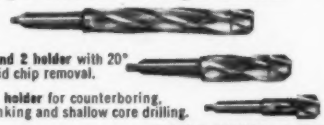
Scully-Jones counterbores, countersinks, and core drills with stub taper drive reduce tooling costs three ways. Replacement cost is lower because these tools have two parts—a cutter with stub shank and a driver. Only the cutter is replaced when worn out. The tough, hardened steel holder can be reused time after time.

They save indirect costs, too, because short, yet rigid and accurate, stub taper shanks are easy to insert and eject. They speed setup and tool change. When countersinking follows core drilling or counterboring, you simply switch cutters—in seconds—the holder stays in the machine.

Other savings come from elimination of cutter damage and scrap. The tang on the stub taper shank mates with a slot in the holder—provides a positive, slipproof drive.

For complete information on this unique tooling method, see your Scully-Jones distributor or representative, *or* phone: BIshop 7-5900.

Scully-Jones and Company
1913 South Rockwell Street, Chicago 8, Illinois



Styles 1 and 2 holder with 20° flutes to aid chip removal.

Style "B" holder for counterboring, countersinking and shallow core drilling.

SCULLY JONES CUTTING TOOLS

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Every TOOL ROOM NEEDS THIS BIG *Free* REID CATALOG

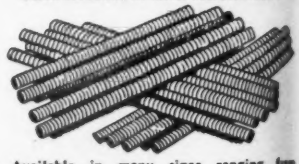
New big FREE 78 page catalog listing scores of accessories and components needed in every tool room, such as malleable machine handles c.i. hand knobs, hand wheels, etc. All are top quality and low cost. Orders welcome for one or a thousand.

BALL HANDLES — Threaded

ROUND PLASTIC — OVA OVAL PLASTIC — MUSHROOM PLASTIC

Will give your product that "dressed-up" appearance. Made in a wide variety of diameters and thread sizes. Round and oval plastic supplied in red or black. Polished steel handles also supplied. Low prices and finest quality.

COMPRESSION SPRING ASSORTMENT



Available in many sizes ranging from 3/32" to 1½" diameter. Made from music wire. All springs 10" long. Select the size required and cut to length wanted. Saves time and money.

Extension spring assortment, ranging in diameters from ⅛" to 1". All are 11" long. Low prices.

REID TOOL SUPPLY CO.
MUSKEGON HEIGHTS, MICHIGAN

CIRCLE INFORM-A-GRAM KEY NO. 1363

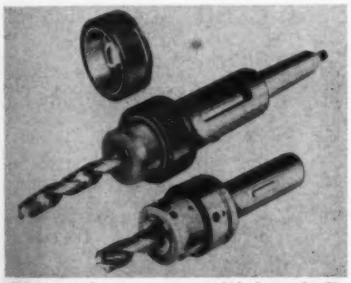
Product News

Toolroom Grinder

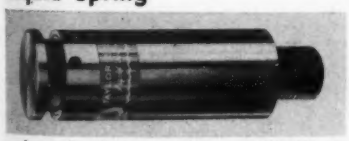
A 3" x 12" capacity between centers and a 5" swing are features of the Myford MG12 cylindrical grinder. Finishes to 3 micro-inches and repetitive accuracy to 0.0001" are obtainable. It's especially good for precision grinding of small manufactured parts. Bentley Industrial Corp., 41 E. 42nd St., New York 17, or Circle No. P53.

Save By Stubbing

Lower fixture costs, longer drill life, and faster tool changes are possible on single- or multiple-spindle drills using a new Stub-A-Long drill collet chuck. It eliminates guide bushings and torsional windup. Scully-Jones and Co., 1901 S. Rockwell St., Chicago 8, or Circle No. P54.

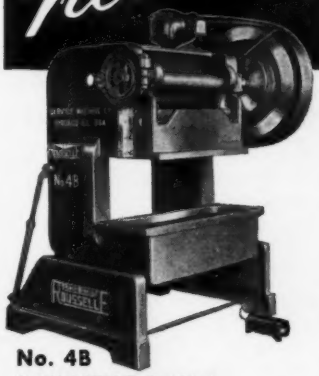


Liquid Spring



A preload from 500 to 5000 lbs is provided by a new Model 1028 liquid spring using liquid compressibility. It has short stroke, high force and is only 1¼" dia by 3½" long. Get Catalog S from Taylor Devices, Inc., 188 Main St., N. Tonawanda, N.Y., or Circle No. P55.

New 40-TON DOUBLE CRANK O. B. I. ROUSSELLE



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- "Plug-in" foot and hand controls.
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CHOICE OF 30 SIZES AND TYPES IN 5 TO 40-TON PRESSES

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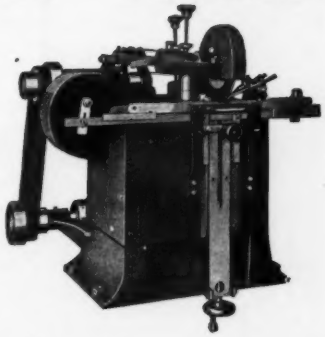
For Only a Few Pennies

You can sharpen a gross of Hack Saw Blades with Wardwell's "EC" Combination Grinder. When you have done this only six times you have saved the cost of the machine.

The Wardwell "EC" is the **only** grinder that does not depend upon shape of grinding wheel to form shape of teeth.

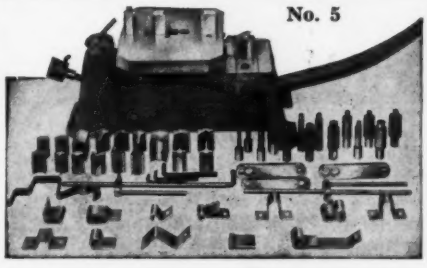


WARDWELL
3809 Ridge Road
Cleveland 9, Ohio

For full information about the "EC" Combination, write now.

CIRCLE INFORM-A-GRAM KEY NO. 1372

No. 5



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Multiform

BENDER-CUTTER

CUTS, BENDS, PUNCHES

Available in hand, air or hydraulic models. The MULTIFORM is shipped complete with full assortment of dies and mandrels to form and cut round or flat stock up to ⅛" x 1½" as illustrated. Punching dies available. Other models up to ½" x 8" hydraulic operated. Ideal for steel rule die forming.

ALSO AIR OPERATED MODELS

KALAMAZOO, MICH.

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24 HOUR DELIVERY

of *Standardized* Punches . . . at 60% SAVINGS!

Standardized, centerless ground perforating punches that represent immediate savings!

Here's Why!

Accuracy — Centerless ground to within ±.0003 in diameter, with a bright finish!

Quality — A special, high-carbon steel insures tough, lasting durability!

Economy — Standardization means smooth, high speed turnout . . . at a fraction of the cost of making your own!

Delivery — Huge stocks of high carbon and H.S.S. punches, in many sizes, guarantee shipment the SAME DAY your order is received!

Ross

Most of the nation's leading companies have standardized on ROSS HIGH CARBON and HIGH SPEED STEEL PERFORATING PUNCHES . . . at terrific savings! Write **now** for FREE punch sample and descriptive literature.

ROSS EQUIPMENT CO., INC.

77A College Ave., Rochester 7, N. Y.

CIRCLE INFORM-A-GRAM KEY NO. 1381

ALINA HORIZONTAL DIAL COMPARATOR H-20

For high production—low tolerance applications!

The large 3 ¼" diameter dial indicator permits rapid, highly accurate readings because of widely spaced and easily visible graduations. The H-20 is equipped with the M-50 dial indicator that can also be furnished separately. This highly sensitive indicator is jewelled at critical wear points and has a range of .120"

WRITE FOR CATALOG.

ALINA CORPORATION

122 East Second Street, Mineola, L. I., N. Y.

CIRCLE INFORM-A-GRAM KEY NO. 1382

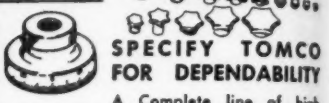
Tomco INC.

HAND WHEELS

SPECIALS

- HAND KNOBS
- MACHINE HANDLES
- HANDLES
- BALL HANDLES
- LEVERS
- SPECIALTIES

GRADUATED DIALS



SPECIFY TOMCO FOR DEPENDABILITY

A Complete line of high grade hand knobs, levers, handles, hand wheels, graduated dials is available for immediate shipment from stock of standard items. Specialty items made to your specifications.

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Tomco

RACINE 2, WIS.

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You Get Things Done With Boardmaster Visual Control

- ☆ Gives Graphic Picture of Your Operations—Spotlighted by Color
- ☆ Facts at a glance—Saves Time, Saves Money, Prevents Errors
- ☆ Simple to operate—Type or Write on Cards, Snap in Grooves
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- ☆ Made of Metal. Compact and Attractive. Over 400,000 in Use

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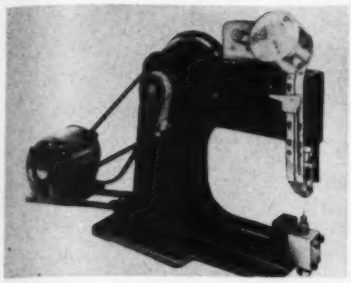
GRAPHIC SYSTEMS

55 West 42nd St. • New York 36, N.Y.

CIRCLE INFORM-A-GRAM KEY NO. 1384

Product News

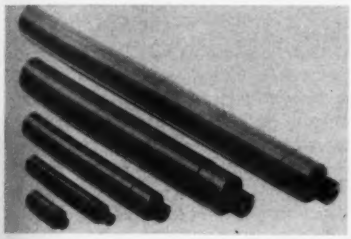
Tubular Riveter



Tubular rivets from the smallest up to 5/16" dia and ½" long can be fed and set by this automatic, heavy-duty, electric riveting machine. Model 500 is ideal for light assembly fabricating and fastening, including electronic and electrical components. Eyelet Tool Co., Inc., 236 Broadway, Cambridge 39, Mass., or No. P56.

Make Jigs Easily

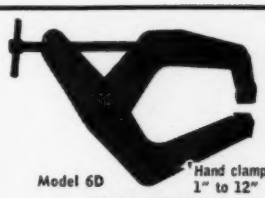
To make low-cost plate jigs just assemble four Jergens jig legs on a plate. Leg-ends and rest buttons



are hardened for longer wear, and larger bearing surface at leg top assures lasting accuracy in plate type jigs. Get details from Jergens Tool Specialty Co., 712 E. 163 St., Cleveland 10, or Circle Inform-A-Gram No. P57.

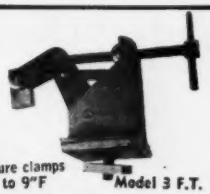
Heavy Duty Switch

This New Oil-Tight Pressure Switch is for heavy-duty applications on machine tool hydraulic systems operating at pressures up to 5,000 psi. Bulletin 838, Type T, has a calibrated range scale and indicator to show operating pressure. Write Allen-Bradley Co., 136 W. Greenfield Ave., Milwaukee 4, for details, or Circle Inform-A-Gram No. P58.



Kant-Twist CLAMPS

- Combine best features of "C" and parallel clamps.
- High Tensile Steel.
- Used by all industries.



Model 6D Hand clamps 1" to 12" Fixture clamps 2"F to 9"F Model 3 F.T.

SAXTON MANUFACTURING CO.

1517 NO. POTRERO • EL MONTE, CALIF.

CIRCLE INFORM-A-GRAM KEY NO. 1391

DYKEM STEEL BLUE

Stops Losses making Dies and Templates

Popular package 8-oz. can fitted with Bakelite cap holding soft-hair brush for applying right at bench; metal surface ready for layout in a few minutes. The dark blue background makes the scribed lines show up in sharp relief, prevents metal glare. Increases efficiency and accuracy.

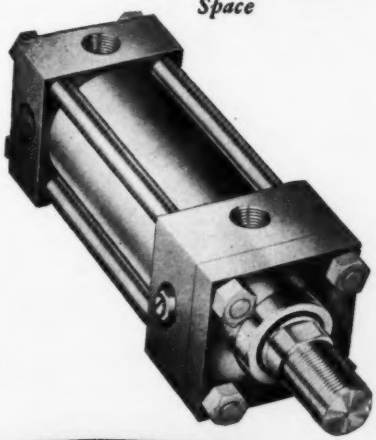
Write for sample on company letterhead

THE DYKEM COMPANY

2303L North 11th St. • St. Louis 6, Mo.

CIRCLE INFORM-A-GRAM KEY NO. 1392

Maximum Working Force in Minimum Working Space



Milwaukee

Air or Hydraulic

CYLINDERS

- Quality Construction Throughout
- No Costly Down Time
- Guaranteed Top Performance
- Precision Designed—Heavy Duty Service
- Conforms to JIC Specifications

Get all the facts and see how Milwaukee Cylinders save space and weight . . . Save on original cost and save on maintenance.

Write today for Free Bulletins A-100 and H-100.

Standard Models
Hydraulic Bore Size 1½ to 12"
Air Bore Size 1½ to 14"
Specials built to your specifications

MILWAUKEE CYLINDER CO.

Division of L. & M. Machine Company

5756 So. Pennsylvania Ave., Cudahy, Wis.

CIRCLE INFORM-A-GRAM KEY NO. 1393

±.0005" ACCURACY

Here's Real Precision *Plus* Multiple Tool Efficiency

ENCO TOOL POST TURRETS

Boost lathe production, cut costs, reduce tool switching and re-checking, cut set-up time, with ENCO 12-station tool post turrets! Holds 4 maximum size tools . . . . 3 working positions each. Sturdy and rigid for hogging cuts, yet unsurpassed for close-tolerance work.

ON-THE-BALL RE-INDEXING

Spring loaded balls locked between perfectly milled spherical seats provide consistent re-indexing accuracy. "On the ball" every time!

There's an ENCO turret for every lathe.

Mail coupon for cat. #53 and name of nearest Enco Franchise Dealer.

ENCO Mfg. Co.
4520 W. Fullerton
Chicago 39

PRECISION ENCO ECONOMY

ENCO Manufacturing Co.
4520 W. Fullerton,
Chicago 39, Dept. 799

Please send catalog #53 and full details of ENCO 12-station tool post turrets.

Name_____

Firm_____

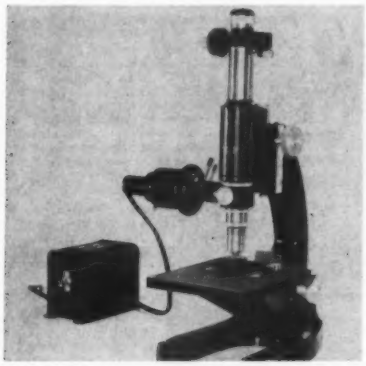
Address_____

CIRCLE INFORM-A-GRAM KEY NO. 1394

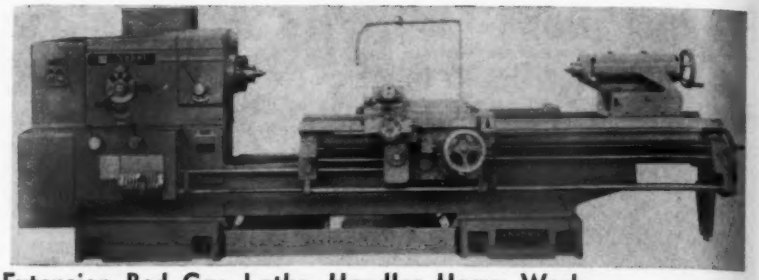
Product News

Controls Plating Thickness

A new low-cost electroplater's microscope features a Filar micrometer eyepiece and fine adjustment knob



to rapidly and accurately measure plating thickness. Model AM can be converted to metallurgical microscope by adding accessories. Bausch & Lomb Optical Co., 635 St. Paul St., Rochester 2, N.Y. offers Catalog D-1085, or Circle No. P59.



Extension Bed Gap Lathe Handles Heavy Work

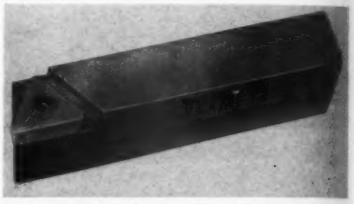
The dual purpose heavy-duty lathe can operate as a rugged engine lathe with 26½" swing over the bedways, or as a versatile gap lathe for large, odd-shaped parts, with 46" swing through the gap. With it, it's possible to select 18 gear driven speeds from a direct reading color index and easily control them by two levers and color keyed speed plates. Speeds up to 1500 rpm available. The Nebel Machine Tool Corp., 3401 Central Pky., Cincinnati 25, or Circle No. P62.

Improved Lubricant

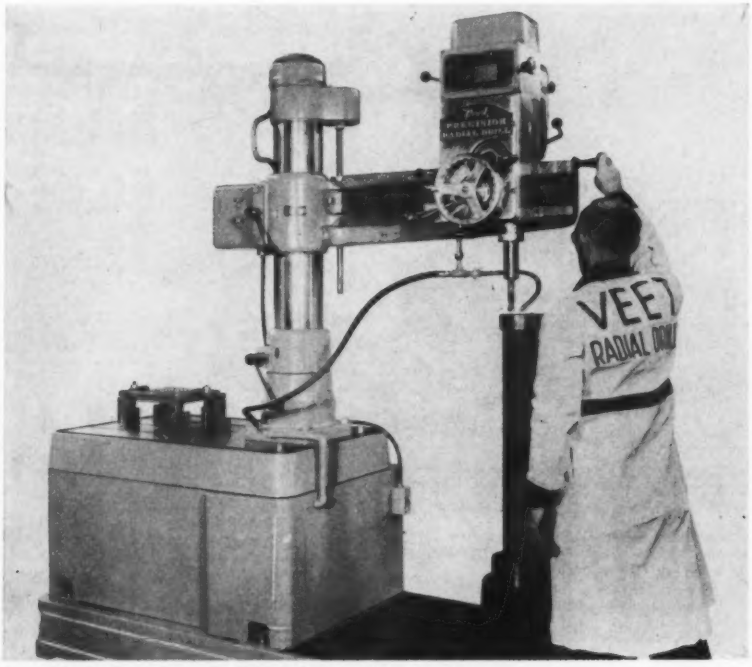
An Improved Clinging-Type Lubricant, applicable to all surfaces at all angles for drilling, tapping, reaming, and drawing of all metals, leaves a rust inhibitor on the metal when flushed off that can be removed easily by solvent. Micronoil drill and tap lube is available from Protective Coatings Inc., Box 3985, Detroit 27, or Circle Inform-A-Gram No. P60.

Screw-On Insert Holders

Holders for the new precision screw-on type Kendex inserts are now available from Kennametal Inc., Latrobe, Pa. The inserts are used



for small boring bars and automatic tooling for small parts on which the design or size of standard clamped type tools limits their use. Indexable to within ±0.005" of all cutting edges. Write company for data, or Circle Inform-A-Gram No. P63.

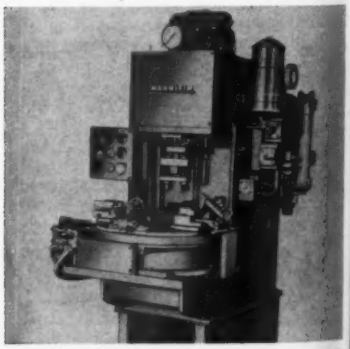


Two-Table Drill Features Big Work Area

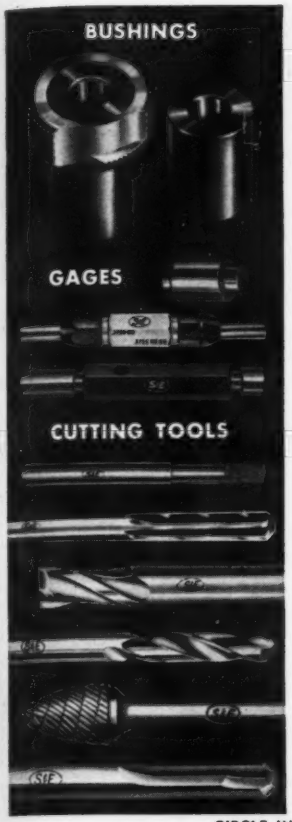
A heavier base and 20% larger working surface on the lower table are improvements in the new Veet double-end radial drills. One operator can set up 62" high workpieces on the low table while another is setting up smaller workpieces on the upper table. Veet Industries, E. Detroit, Mich., or Circle Inform-A-Gram No. P61.

Hydraulic Presses

For Forming, Trimming, and Force-Fit Assembly Operations, use the new FD Series high-speed hy-



draulic presses. Offered in bench models from 2- to 6-ton capacities and floor models from 6- to 15-tons. All models have hydraulically operated Hannifin index tables. Hannifin Co., Dept. 164, Des Plaines, Ill., or Circle Inform-A-Gram No. P64.



THE QUALITY EXTRA...

in S&E Tungsten Carbide Tools

— IS FREE

Tool performance that increases your production and profits—yet costs you less money . . . it's what you want and what you get —when you use S&E TOOLS

That extra quality is no accident. It is the product of more than 20 years experience in the design and manufacture of Tungsten Carbide Tools.

Prove to your own satisfaction that the performance and stamina you need in tooling today—you get in S&E. A fully illustrated catalog of standard and special tools is available upon request.

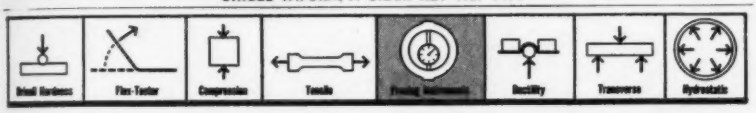
WRITE:

S&E MACHINE PRODUCTS INC.

Bridgeport, Michigan

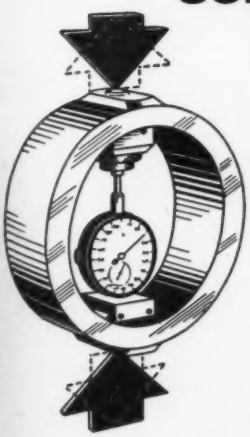
Representatives in all principal cities.

CIRCLE INFORM-A-GRAM KEY NO. 1411



proving rings to measure any load

COMPRESSION or TENSION



Steel City offers two styles of proving rings which require no adjustment during use. The dial-indicator ring (illustrated) measures deflection in increments of 0.0001". Applied load or force is determined from a calibration report furnished with each instrument*. With this type of ring, even an inexperienced operator can repeat readings as close as 1/10 of 1%.

Optical-type proving rings, developed for the USAF, use a ruled scale and a high-powered microscope for readings in increments of 0.00002". Repeat readings as close as 1/20 of 1% can be achieved.

Compression and tension models are available in either style, with capacities up to 200,000 lb., all manufactured of special-alloy steel by experienced craftsmen. They are used for calibrating Brinell testers, testing machines and presses, and load cells, or for measuring applied loads.

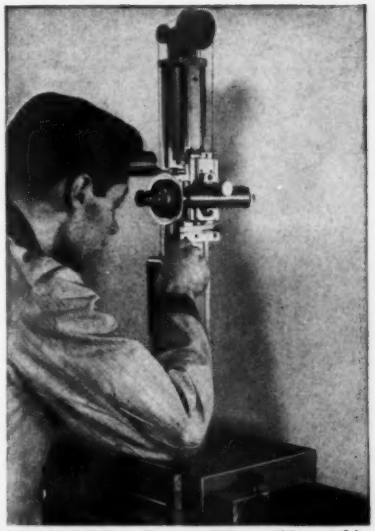
**National Bureau of Standards calibration report when desired.*

Write for literature, prices and name of nearest distributor.

Steel City Testing Machines Inc.

8815 Lyndon Ave., Detroit 38, Mich.

CIRCLE INFORM-A-GRAM KEY NO. 1412



M1238-1818 — *Range 18" x 18", working distance 9" to infinity. Reads to 0.001" up to 24" working distance. Protractor ocular reads to 3 minutes of arc. Image is erect.*

Cut inspection time in half

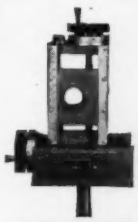
with new Gaertner Coordinate Cathetometers

These convenient, reliable optical instruments permit making precise coordinate measurements in a vertical plane. The two dimensions are measured with one setting, object does not have to be rotated. Inspection time is cut in half and resetting errors eliminated.

Versatile Gaertner Coordinate Cathetometers are ideally suited for precision measurements on large objects; also objects or points in recessed, remote, or inaccessible locations. Applications include measuring jet engine sections, complicated castings, printed circuits, bolt holes and bosses on large piece parts, traces on cathode ray tubes, etc.

Because these are optical rather than mechanical measuring instruments, you make non-destructive measurements without contact, distortion, or concern about pressure being applied to the object when making a setting. Instruments available in English or Metric system.

M1236-46— Horizontal range 6", vertical range 4", Reads to 0.0001", working distance 5" to infinity.



M1236-22— Range 2" x 2", reads to 0.0001". Working distance 5" to infinity. Shown with 19 mm mounting rod, and without telemicroscope. Instrument permits precise coordinate movement of other objects such as photo cells, probes, etc., in place of telemicroscope.

Write for Bulletin 188-53 & 194-57

The Gaertner Scientific Corporation

1242 Wrightwood Ave., Chicago 14, Ill.

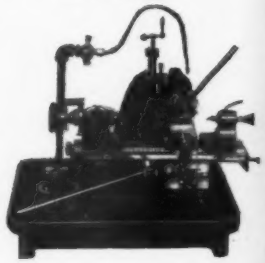
Telephone: BUckingham 1-5335

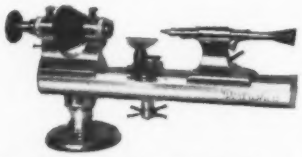
CIRCLE INFORM-A-GRAM KEY NO. 1413

Derbyshire AND HIGH PRODUCTION ARE SYNONYMOUS

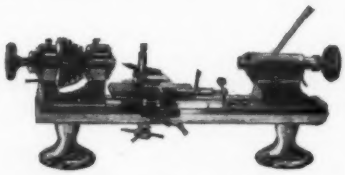
Accept no substitutes for the original of the American watch and instrument lathe. For many years, DERBYSHIRE has set the standard for watch and instrument lathe manufacturing and there is no substitute, here or abroad, for this precision-made equipment. When you buy . . . buy "DERBYSHIRE."!

MICROMILL
2 Table Surfaces: 7⅞" x 2⅜" — 12" x 2⅜" — Takes Magnus Collets.

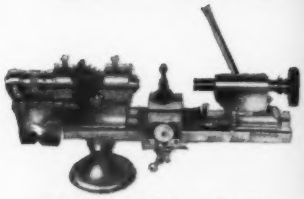




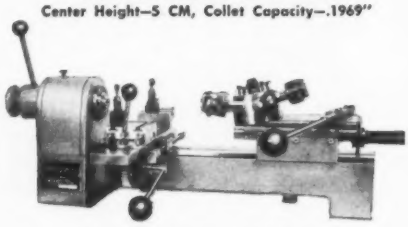
WEBSTER WHITCOMB 12" BED
Center Height—S CM, Collet Capacity—.1969"



ELECT LATHE — 18" BED
Center Height—2.35" (6 CM)
Chuck Capacity—.004" to .315"



MAGNUS LATHE — 12" BED
Center Height — 5 CM
Collet Capacity — .315"



MODEL No. 750 — 22" BED
Center Height — 7.50 CM, Collet Capacity — .315"

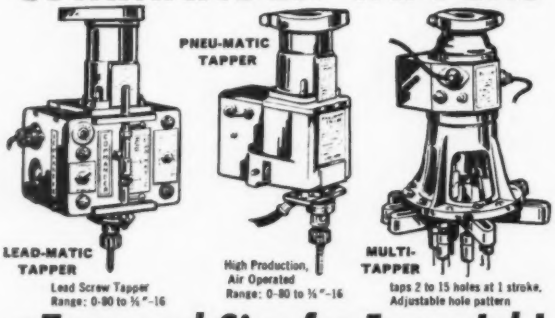
If you have a problem . . .

. . . concerning small precision turning or milling, one of these lathes or the milling machine shown should solve it. Write for Catalog.

F. W. DERBYSHIRE, INC.
157 HIGH STREET
WALTHAM MASS.

CIRCLE INFORM-A-GRAM KEY NO. 1421

COMMANDER TAPPERS



LEAD-MATIC TAPPER
Lead Screw Tapper
Range: 0-80 to ¼"-16

PNEU-MATIC TAPPER
High Production, Air Operated
Range: 0-80 to ½"-16

MULTI-TAPPER
taps 2 to 15 holes at 1 stroke. Adjustable hole pattern

a Type and Size for Every Job!

MIDGET TAPPER
Pressure Sensitive Drive
Range: 0-80 to 10-24

STANDARD TAPPER
Adjustable Torque Control
Range: 0-80 to ¼"-16

Commander Tappers are made in 10 models—each designed to handle tapping jobs over a wide range. From the Commander Tapper line, you can select the right unit to give you the exact performance your job requires. Whichever Commander Tapper you select, you will get unequalled performance and tapping economy. Sold and serviced by drilling and tapping specialists. Write for the Commander Production Tool Catalog and name of nearest Distributor.

Commander MFG. CO.
4222B WEST KINZIE STREET • CHICAGO 24, ILLINOIS

CIRCLE INFORM-A-GRAM KEY NO. 1422

ARE YOUR OPERATORS STRUGGLING TO WORK TO TENTHS WITH "GUESSWORK" GAGES?

For holes ⅛" to 10" diameter

HAND 'EM COMTORPLUG

hand 'em EXACT GAGING KNOWLEDGE

Comtorplug eliminates errors due to human variations, or to the shortcomings of "guesswork" gages.

Comtorplug Tells:
Actual hole size; large .0001" graduations; fixed, not passing, reading.
Front or back taper, exact amount of.
Ovality, exact amount of.
Bell mouth or barrel shape, exact amount of.

POSITIONING of the unique expansion plug in the hole gives precise 2-point gaging, automatically aligned and centered.

GAGING PRESSURE is always uniform.

READING is fixed (not passing), easily read to a fraction of a tenth.

REASONABLE COST makes widest use practical.

SEND FOR BULLETIN 50 →

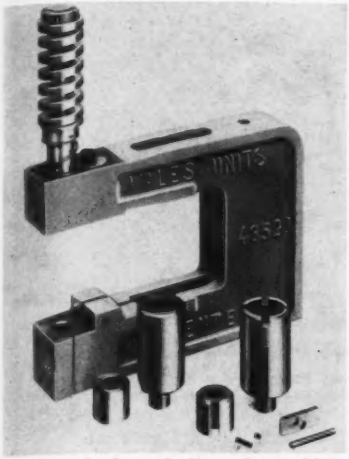
COMTOR CO., 82 FARWELL ST., WALTHAM 54, MASS.

COMTORPLUG

CIRCLE INFORM-A-GRAM KEY NO. 1423

New Die Base

Type CJ unitized hole punching units now have a new type die base which cuts replacement costs of



round and shaped dies about 50%. They're interchangeable with previous one-piece pedestal dies and die buttons need only be replaced. Get details from Wales Strippit, Inc., 212 S. Buell Rd., Akron, N.Y., or Circle Inform-A-Gram No. P65.

Radius Checker

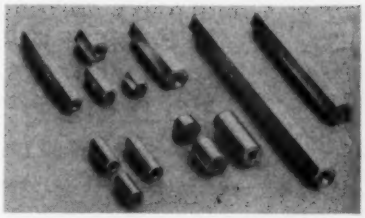
Precision measurement of the tool nose radii to assure accurate machining is done on this precision radius checking instrument with an electronic checking device. The checker may be equipped for recording tool contours on a direct reading oscillograph. For additional information, contact The Monarch Machine Tool Co., Sidney, Ohio, or Circle Inform-A-Gram No. P66.

Miniature Grinding Gages

Calipers as small as 0.060" can now be furnished for some applications with the addition of the Model SG continuous grinding gage. Picture shows the gaging contacts being retracted by a finger grip to permit placing the calipers on the work without damaging either workpiece or gage contacts. Federal Products Corp., Providence 1, or Circle Inform-A-Gram No. P67.

Standoffs and Spacers

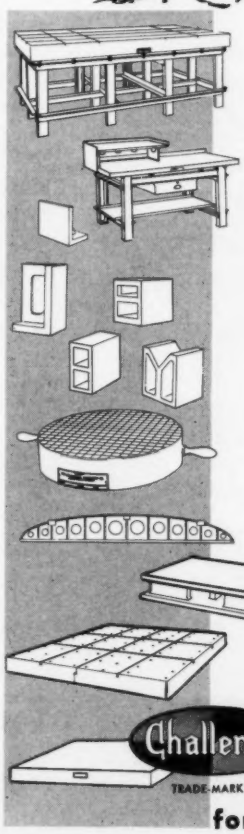
Round, hexagon, and square standoffs and spacers are available in va-



rious materials and lengths from ⅛" to 10". Tolerances on length are ±0.005". Write for information to Amatom Electronic Hardware Co., Inc., 88 Drake Ave., New Rochelle, N.Y., or Circle No. P68.

need to hold CLOSER TOLERANCES?

HERE ARE OVER
300 AIDS to
PRECISION
PRODUCTION



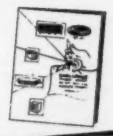
More than 300 different items are available in the Challenge Precision Surface Equipment line to help you maintain close control of accuracy in your tooling, manufacturing assembly and inspection operations.

These include both Granite and Semi-Steel Surface Plates of all types and sizes. Also Semi-Steel Angle Plates, V-Blocks and many other items of precision surface equipment. In addition, many special sizes and types can be made-to-order.

Take this important step toward cutting costs and minimizing rejects. Get information on Challenge Precision Surface Equipment to improve your operations.

SEND FOR THIS HANDY FREE CATALOG covering description and prices on all standard items.

THE CHALLENGE MACHINERY CO.
GRAND HAVEN, MICHIGAN



SE-122

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Challenge TRADE-MARK ®
PRECISION SURFACES
for LAYOUT • INSPECTION • ASSEMBLY

CIRCLE INFORM-A-GRAM KEY NO. 143

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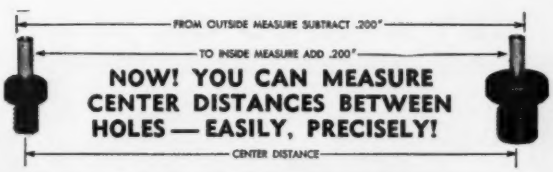

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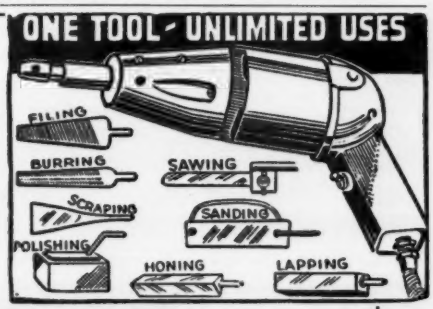

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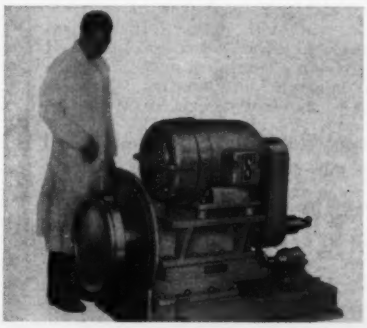

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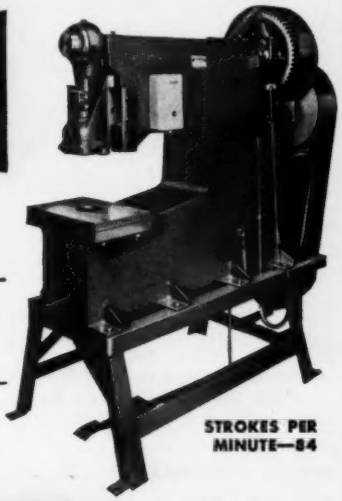

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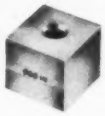

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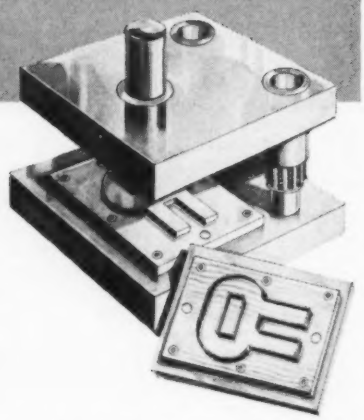

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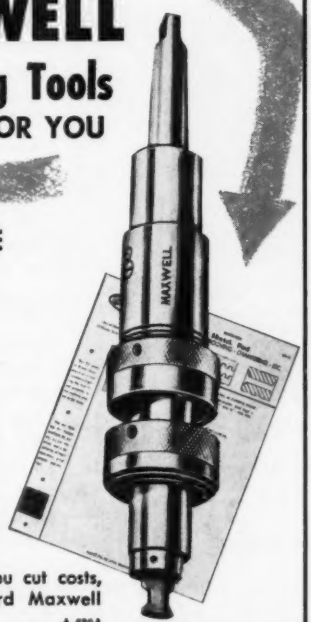

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Company:	Jonathan Mfg., Fullerton, Calif.
Attachment:	"New TAPMATIC High Speed Reversible"
Part:	Chassis Slide Rails
Material:	Aircraft Quality Aluminum
Tap Size:	#4-40, #8-32 and ¼"-20
Type Tap:	Fluteless
Speeds:	To 2200 rpm
Machine:	Drill Press

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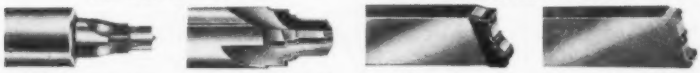

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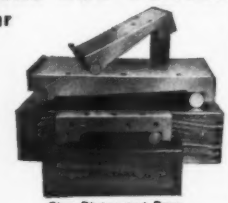

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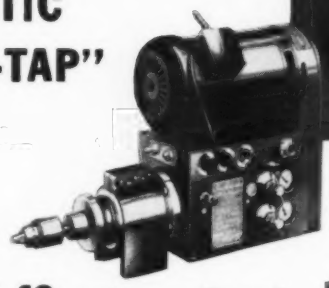

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